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CONTENTS.

	PAGE
ADVERTISEMENTS	109
INDEX OF APPLICATIONS FOR PATENTS	119
SEPARATING CREAM FROM MILK	111
REVIEWS—	
Margetts' New Account System.....	112
Pratt's Key to the Universe.....	112
Young on Colliery Explosions	113
Wheeler's Photography	114
Serials	114
IMPROVEMENTS IN DUBLIN HARBOUR.....	115
DISTINGUISHING BUTTER FROM OTHER FATS.....	115
NOVEL ROTARY PUMP	115
IR HENRY BESSEMER.....	115

	PAGE
PROCEEDINGS OF THE INSTITUTE.....	116
MONTHLY NOTICES	116
TITULAR DIGNITIES AND MEN OF SCIENCE.....	117
PROCEEDINGS OF SOCIETIES—	
Royal Society	118
Geological Society	104
Asiatic Society.....	118
Statistical Society.....	118
Linnean Society	118
Mathematical Society	119
Anthropological Institute	119
Zoological Society	121
Chemical Society.....	120

	PAGE
Societies—Continued	
Geographical Society	120
British Archaeological Society	120
Entomological Society	120
Historical Society	121
Physical Society	121
STEAM ENGINE OF THE FUTURE.....	121
CORRESPONDENCE.....	122
TUCKER'S "UNIVERSAL" CRAMP	122
FOREIGN SCIENCE	122
BRITISH COMMITTEE AT PARIS CONGRESS.....	122
POETRY	122
SPONTANEOUS COMBUSTION.....	122
RECENT AMERICAN AND FOREIGN PATENTS.....	122

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- MOTIVE-POWER Machines, Obtaining Motive power.—H. Boden, 2538. J. B. Rogers, 2554. P. Davies, 2673. J. and J. A. Baker (com.), 2824. W. R. Lake (com.), 2863.
- MUSICAL INSTRUMENTS, &c.—A. and T. J. Evans, 2712. P. Barry and W. M. Jones, 2807. T. Dawkins, 2847. J. A. R. Hildebrandt (com.), 2861. J. Robinson, 2907. E. Schultz (com.), 2930.
- NAILS, Spikes, Bolts, Rivets, Screws, &c.—A. M. Clark (com.), 2429. W. H. Richards, 2751. W. Southwood, 2805. A. Jones, 2835. W. G. Buddoog, 2932.
- OILING or Lubricating, &c.—H. Myer, 2660. T. H. Thompson, 2719. H. J. Haddan (com.), 2739. H. Simon (com.), 2927.
- OILS, Fatty Matters, Grease.—T. H. Gray, 2518. W. Young, 2537. R. Gottheil (com.), 2720. A. M. Clark (com.), 2790. S. Pitt (com.), 2860. T. M. Spiby, 2941.
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- OYSTERS.—B. Hunt (com.), 2779.
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- PACKING Cases, &c.—A. Stewart and J. Houston 2550.
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- PICTURES, &c.—J. Francis, 2555.
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- PLANTS, Trees, Seaweeds, &c.—L. Thiercelin, 2539. H. Simon (com.), 2870.
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- PROPELLING Ships, Propellers, Paddle-wheels and Screws.—C. N. Dunderdale, 2484. S. W. Snowden, 2667.
- PUMPS, Pumping and Raising Water and other Liquids, Pumps, Pistons, and Packing.—J. Shaw, 2641. A. M. Clark (com.), 2644. J. Adams and A. Watt, 2665. E. W. Anderson (com.), 2693. G. Best, 2713. A. M. Clark (com.), 2788. A. M. Clark (com.), 2790. T. Melling, 2792. J. and J. A. Baker (com.), 2824. J. C. Mewburn (com.), 2841. T. and G. Wilson, 2922.
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- RAILWAYS, Carriages, Coupling, Uncoupling, and Altering Position of Carriages and Engines.—F. M. Rogers, 2697. U. Scoot, 2812. S. Leach, 2832. N. Chandler, 2896.
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- REFRIGERATING, &c.—E. Tuteur, 2627. H. J. Haddan (com.), 2740. F. N. Mackay, 2883. B. Latham and J. T. Way, 2928.
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- SHIP and Boatbuilding.—A. M. Clark (com.), 2499. R. B. Bell and P. N. Henderson, 2516. W. R. Lake (com.), 2607.
- SHIPS' CARGOES (Loading and Unloading.—R. B. Bell and P. N. Henderson, 2516. J. Gillett, 2766.
- SHIPS' Rigging and Sails.—V. Coombe, 2525.
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- SIGNALS, Alarms, Communicating Apparatus, Conveying Sounds.—L. A. Brasseur and O. A. E. Dejaer, 2493. W. B. Barker, 2520. E. Tyer, 2575. S. Pitt (com.), 2674. G. W. von Nawrocki (com.), 2767. J. S. Williams, 2785. P. Barry and V. W. Jones, 2807. J. S. Williams, 2940.
- SIPHOONS.—A. M. Clark (com.), 2788. A. M. Clark (com.), 2790. W. P. and C. E. Cherry, 2862.
- SMOKE (Preventing, Burning, and Condensing.—T. J. Allan and J. Boes, 2731.
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- SOUNDINGS.—W. Moseley and T. S. Trumble, 2876.
- SOWING Seeds, &c.—F. T. Turner and F. Mote 2647. C. T. Burchardt (com.), 2773.
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- SPRAY Producers.—D. Marr, 2818.
- STAMPS, &c.—C. Pieper (com.), 2925.
- STAYS.—W. H. Taylor, 2595. W. Wilson, 2878.
- STEAM Boilers, &c.—J. Keith, 2709. J. Cassels, 2760. J. Ellwood, 2764. J. Brown, 2768. W. R. Lake (com.), 2852. H. E. Newton (com.), 2880. H. Simon (com.), 2929.
- STEAM Engines.—L. A. Groth (com.), 2568. H. and E. Brecknell, 2570. J. Barclay, 2611. J. M. Whiting, 2639. W. Adams and J. Clemenson, 2689. E. W. Anderson (com.), 2692. W. Wolff, 2722. W. R. Lake (com.), 2787. E. B. Allen (com.), 2871. H. Tipping, 2913.
- STEAM Traps.—C. Holste, 2899.
- SUGARS, &c.—F. E. V. Beanes, 2502. A. Stewart and J. Houson, 2550. T. Welton, 2559. W. R. Lake (com.), 2584. E. Kunkler, 2834.
- TARGETS.—W. R. Lake (com.), 2545.
- TELEGRAPHS; Telegraph Printing Apparatus.—A. Marr, 2492. E. Syer, 2575. F. A. Ormiston (com.), 2600. A. Bondst and J. Bourdin, 2556. E. C. Warburton, and L. J. Crasley, 2554. A. Blondot and J. Bourdin, 2556. S. Pitt (com.), 2674.
- THRASHING Machines.—W. H. Doughty and J. P. Bradley, 2659. C. Middleton, 2586. H. R. Lumley, 2687.
- TRAMWAYS and Tramway Carriages, Tramway Locomotives.—J. Barclay, 2612. U. Scott, 2812.
- UMBRELLAS, Parasols, &c.—A. M. Clark (com.), 2534. T. Bentley, 2745. W. Wainman, 2748.
- UPHOLSTERY.—J. B. Rowcliffe, 2689. T. P. Frost, 2777. G. F. Redfern (com.), 2885.
- VALVES, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—T. Sutcliffe, 2495. W. Bartholomew, 2733. J. Brown, 2768. W. R. Lake (com.), 2787. T. Melling, 2792. E. T. Lambert, 2819. H. Simon (com.), 2929.
- VELOCIPEDS, Bicycles.—S. Davis, 2476. Sir J. L. Foulis, 2483. C. Mosely, 2602. J. Turner and A. Dewey, 2920.
- VENTILATION; Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—C. H. von Ullner, 2622. R. Munn, 2843. W. C. Woodhead, 2937.
- WARPING.—T. Monks, 2726.
- WATERCLOSETS, &c.—W. Wright, 2664. T. Holroyd, 2915.
- WATERWHEELS and Engines, &c.—J. Adams and A. Watt, 2665. H. Tipping, 2913.
- WATERPROOFING.—J. Neville, 2589.
- WEAVING, Braiding, Plaiting, Preparing for Weaving.—J. and W. Rawnsley and J. Crowther 2487. E. Briggs, 2498. E. Mackerell, 2507. J. Molesworth and W. Ward, 2528. F. Wirth (com), 2621. J. J. Shiers, 2630. T. Sagar, 2679. J. Hollingworth and J. J. Buckley, 2702. H. E. Newton (com.), 2707. R. and J. Shiers, 2723. W. Morgan-Brown (com.), 2746. J. Richardson, 2897.
- WHEELS for Carriages, &c.—J. Wilson and S. Newland, 2540. W. Botwood, 2625. H. J. Haddan (com.), 2727. T. Chappel, 2762. E. Honychurch, 2904.
- WHEELS for Machinery.—G. L. Scott, 2749.
- WINDOW BLINDS, &c.—L. D. Contes, 2527. G. Whitaker, 2613. J. A. F. Aspinwall, 2850.
- WINDOWS.—J. S. Maryon, 2643. J. Carson, 1794. T. W. Heliwell, 2895.
- WINE.—E. Kunkler, 2834.
- WRENCHES, Spanners.—C. Neil, 2851. A. Jackson and J. Dunn, 2889.

*** The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.

NEW DEVICE FOR SEPARATING CREAM FROM MILK.

A NOVEL device for separating cream from milk consists of a can for containing milk, to which is fitted a pan for containing water. The can is provided with an airtight cover, from which a tube projects nearly to the bottom of the water pan. In the top of this tube there is a valve, and a pump is attached to the cover immediately above the tube.

The can is filled with milk nearly to the lugs that support the water pan, and the latter is filled with water and placed in the can. The cover is then put on and fastened, and the pump is applied.

By removing the water from the pan a vacuum is created in the can, which is said to greatly facilitate the raising of the cream. This device was recently patented by Mr. S. L. Plumb, of Portage, Wis.

Reviews.

MARGETTS' NEW ACCOUNT SYSTEM.

"Coin Label Account System, for Facilitating Accounts 'under Her Majesty's Letters Patent.' Part I. for Industrial Associations, Penny Banks, &c., contains specimen leaves of members' pass book and set of account forms," with introductory essay, by VIATOR. London: Edward Kennedy, 13, Warwick-court, Holborn, W.C. 1879.

THIS work briefly describes the nature and uses of a newly-invented system of checking receipts and payments, patented by Mr. Margetts of Margate. A main object of the system is stated to be the shortening of the process by which money is received and paid at industrial banks and other institutions, and also to prevent fraud on the part of agents. In the introductory essay much information is given as to joint-stock banks, trustees' saving banks, Post Office savings banks, and penny banks, and other institutions, the adaptability of the invention to all being fully explained. The following description of its nature and object is presented to the reader:—

All persons, even the most ignorant, understand the value of the coins of the country in which they live, and if an exact representation on paper of a penny were seen, it would certainly be at once recognised by everyone. One of the leading features of this system is the having paper labels or stamps made which shall be pictures or representations of coins, and which shall have on their margin the name of the association issuing them, with such further devices or engravings to prevent imitation as may be considered desirable. These paper labels must be given in exchange by an association adopting this system to any member paying in money. Thus, if a person pays in one penny, a label representing one penny must be gummed in or inserted in that person's pass book; if one shilling be paid in, a label representing one shilling must be inserted, and so on with all coins under a pound.

If one pound be deposited, or if the accumulated savings amount to one pound, a coin label note of either large or small size for one pound is to be gummed or inserted in the pass book, and a duplicate of such coin label note shall be forwarded to the chief office.

Labels must be made either by a company formed for the purpose, or at the chief office of any association adopting this system. The coin label note on which the one pound coin label is fixed can be lithographed.

It is obligatory that the labels shall clearly show the amount of money they represent; but in other respects they can be made in such a way, and with such devices, as directors or managers of the company or association deem advisable.

A person withdrawing money must present his pass book to an agent, who would take out the label or labels representing the amount required to be withdrawn, thus:— If one penny be required to be withdrawn, a label representing one penny would be taken out; if threepence, a label representing a threepenny piece would be taken out; if one shilling, a shilling label would be taken out; and so on with all amounts up to one pound.

If it were required that a pound should be withdrawn, a label for one pound, together with the note on which it is affixed, would be taken out, and the interest, if any, would be allowed. All persons withdrawing money must write their names and addresses on the agent sheet, unless unable to write, in which case their attested marks must be fixed.

The account forms required to work the

system are only six in number, and consist of:—

Form A, used by agent to record deposits received each day. This form is written in duplicate, which duplicate is retained by the agent for reference. The original is forwarded daily to the head office and filed.

Form B, used by agent to record re-payments made each day. On the back of this form is stated the total of the coin labels cut out from the members' pass books each day. All these coin labels are forwarded daily with Form B to the head office, where they are marked off as paid in the spaces allotted on Form A.

Form C, used by the agent for both his daily coin labels account and cash account, having a space on the back for specifying descriptions of cash in hand.

Form D, a monthly record of agents' transactions, compiled at the chief office, as follows:—

1st. From the actual duplicates of coin label notes in chief office.

2nd. From the returns of labels issued; and

3rd. From the actual notes and labels paid.

Form E, yearly record of agents' transactions.

Form F, one pound label record. The object of this form of account is to reckon up the interest paid or remaining due by an association at the end of each month or year; and by this means the use of ledgers for entering the separate accounts of individual depositors is entirely superseded. All coin label notes are of the uniform value of one pound, and when they are paid at an agency they are forwarded by the agent to the chief office, where they are collected and entered on this sheet under their respective dates of payment. The interest on them is also entered in the proper column.

The duplicates of one pound label notes issued, which the agents forward to the chief office, together with the current interest on them, are also entered on this sheet, and the difference between the number and amount of the paid notes and the duplicates gives the total of the unpaid originals with their interest—in other words, enables the association to ascertain the amount of interest due to members at any given time.

The machine press for making the labels is intended to be of moderate cost, and to be self-registering as to the number of labels turned out daily. Each association adopting the system, and requiring a machine press, must state the size, design, and number of dies required for an estimate of price to be forwarded.

It has hitherto been considered necessary to have separate accounts for each individual member in associations receiving and paying money. This imagined necessity has acted as a great obstacle to the spread of industrial societies inculcating thrift in this country. The labour and expense of keeping these individual accounts, ranging from one penny upwards, was sufficient to deter the formation of industrial enterprises in localities in which they might have been beneficial. The proposed system, by abolishing separate accounts, and making agents responsible for the coin labels with which they are supplied, combines the two essentials most requisite to the success of industrial banks, viz., security and cheapness.

The book of securities appended to the work is intended as a kind of pattern of the shape and size it is proposed that a pass book should be; but, of course, the system could be worked with a pass book of whatever shape would suit the convenience of the different associations adopting it.

It has been thought advisable to add to the system a plan of advertisements in pass books. It is well known that the advertisements in railway guides and other largely circulated works bring to their owners much additional income. It is confidently anticipated that this would also be the case with members' pass books. Say an associa-

tion has twenty thousand members, each of whom has to be supplied with a pass book, advertisements put in by tradesmen, life insurance offices, and others, appealing to the thrifty portion of the community, would have the certainty of attracting the notice of the thousands of members forming the association, all of whom would possess more or less money. It is, therefore, proposed that tenders for advertisements be invited for every five, ten, or twenty thousand books issued in each particular district. This would be a source of revenue to an association, and enable them to issue a pass book of a superior quality, and much stronger than those now used by the existing friendly societies, savings banks, &c. When books of a flimsy character are issued to a rough class of navvies, miners, or labourers, they stand more chance of being doubled up, defaced, or destroyed, and giving trouble to an association, than if made as strong and durable as this method would enable them to be.

To prevent the accumulation of filed A forms at the chief office, and of their duplicates at agencies, it is proposed to re issue pass books and labels to members whose accounts have been in existence five years, the old ones being cancelled.

We have thus endeavoured to present our readers with full information as to this interesting invention, which we commend to the earnest consideration of all who have anything practically to do with monetary affairs.

PRATT'S KEY TO THE UNIVERSE.

"Key to the Universe, or a New Theory of its Mechanism," founded upon a (I.) Continuous Orbital Propulsion arising from the Velocity of Gravity and its Consequent Aberrations, (II.) Resisting Ethereal Medium of Variable Density; with mathematical demonstrations and tables. By ORSON PRATT, sen. First Edition. For sale by William Budge, 42, Islington, Liverpool.

IT is a cardinal principle of action with the *Scientific Review* to give every novelty which is presented to the world in a feasible manner a fair reception; hence we now submit Mr. Pratt's work to the notice of our readers. Whenever an originator is capable of lucidly stating his own case it is the best course to allow him to do, and as Mr. Pratt is quite capable of making his propositions intelligible, we now quote from the preface of his work, in which he states that his new theory of the mechanism of the universe is propounded by the author, not with a design of subverting, or, in the least degree, interfering with the great law of universal gravitation. On the contrary; it is intended to greatly extend the universality of that law. Modern astronomers and scientists have excluded the immense ocean of ethereal substance from the catalogue of gravitating matter, thus limiting the grand discovery of Newton, intended to be universal, to such gross materials only as they may consider endowed with the gravitating power. The aim of the author, therefore, is to vindicate the universality of the law, to rescue it from the environed limits sought to be thrown around it, and to give it that unlimited freedom of action which the distinguished name "Universal" so appropriately and definitely imports.

A new theory of celestial mechanism is at first startling to those who have not given the subject their special attention. They have unhappily formed an idea that all the varied phenomena of the universe can be accounted for by the grand discoveries already made. But this erroneous notion is not general. Mathematicians and the able expounders of the Newtonian system have clearly pointed out numerous outstanding and very important movements among celestial bodies, which cannot be explained with-

out the aid of some new theory. Hence, La Place and others introduced the "Nebular Hypothesis," which seemed for a time to render a sufficient cause for certain movements observed. But, as astronomy advanced, the hypothesis weakened: and recent observations prove its total inefficiency as a cause to expound the phenomena alluded to. Hence the astronomical world are again at sea, without "rudder or compass" to guide them, in respect to the causes which have hitherto so perplexed their most skilful navigators.

Astronomical science, in its present advanced condition, needs a theory which will answer, as far as possible, the following reasonable questions:—

First,—Why are the orbital movements of planets, asteroids, and satellites, in the solar system, in one general direction, namely from west to east, instead of moving indiscriminately in all directions?

Second,—Why do planetary bodies rotate upon their respective axes? Why do they rotate from west to east instead of the contrary direction? Is there any law governing their diurnal periods?

Third,—Why do the eccentricities of planetary orbits differ? Why do the orbits so closely approximate circular forms? Will they eventually become circular? Were they once greatly elongated, like those of comets?

Fourth,—Why are the planes of planetary orbits confined within the narrow limits of the Zodiac? Why are they slightly inclined to each other? Will they ever become co-incident? Did their inclinations ever have a far greater range than they now have? Did any of the planets ever revolve in retrograde orbits?

Fifth,—Why do not the planes of diurnal rotations coincide with the respective orbital planes? Did these planes ever coincide? If so; are there any causes which will compel them into a future co-incident?

Sixth,—If the satellites of Uranus were originally detached from the primary by rotation and condensation, according to the prevailing hypothesis, why have they a retrograde motion in their orbits contrary to that of all others in the system?

Seventh,—If the "Nebular Hypothesis" be true, how is it possible for the inner satellite of Mars to revolve around its primary three times while the planet rotates but once?

Eighth,—Observation seems to indicate that there is an intra-Mercurial planet so near the sun as to have a period less than the solar rotation; how can this be possible if the theory of La Place be true?

Ninth,—Will cometary orbits ever be converted into those of a planetary form?

Until a theory is propounded sufficiently comprehensive to include, at least, partial answers to the above questions, we may consider the great science of astronomy but imperfectly developed. Indeed, a new theory is imperatively called for. As none have recently volunteered their services in this great enterprise, the author, unaided and alone, has launched his humble barque upon this great unexplored ocean, with a compass of his own invention. How far he may succeed in shunning the mists and fogs which others have, unfortunately, encountered will be known after the experiment.

Mathematical demonstrations of the fundamental laws of the new theory have been given. But, in all cases, the author has endeavoured to simplify these analytical investigations by strictly avoiding the use of the higher Calculus, and confining the demonstrations to the simple algebraical rules of ratio and proportion.

The tables in the appendix have required a vast amount of labour in preparing them in accordance with the new theory. But if the mathematical theorems and laws developed shall be of any general utility in advancing a true knowledge of the mechan-

ism of the universe, the author will consider himself amply rewarded for all his wearisome toil.

The work continues the subject in regard to Ethereal Medium, Rotating Ethereal Envelopes, Gravitation, Compound Orbit of the Sun, Aberrations in Elliptic Orbits, Resisting Medium, Resistances in Elliptic Orbits, Invariable Elliptic Orbits, Ethereal Currents, Revolution from West to East, Diurnal or Axial Rotation of Planets, Diurnal Periods or Periods of Rotation, and Reduction of Cometary Orbits to a Planetary Form.

Space will not allow us now to do more than commend this work to the attention of all interested in the subject, but we hope to have an opportunity of affording our readers a deeper insight into the character of the work.

YOUNG ON COLLIERY EXPLOSIONS.

"Colliery Explosions;" being the Subject Matter of a Patent Granted to William Young, dated 24th January, 1879. Belfast: Archer and Sons, Printers, Wellington-place.

THE author's object in writing on this momentous subject is, he states, to enable the general reader, as well as those more deeply interested in coal mining, to understand the cause and remedy for coal pit explosions, and other matters connected therewith; and particularly to enable the working miners to acquire this knowledge, as their lives may be preserved or destroyed by their individual efforts.

The phenomenon of a coal pit explosion has hitherto been a complete mystery to every person; and in consequence much life and property has been sacrificed, and no proper remedy discovered. This state of matters is most unsatisfactory, and has induced the writer to give this subject his consideration. As he has always found a perfect uniformity in the description of these explosions, he has from this circumstance concluded that one omnipotent but unobserved cause must be the one enigma in all these disasters. Having found in these mines a cause adequate to account for all the phenomenon, and being confident that the explanation about to be given represents the correct and true cause of these formidable explosions, he will endeavour to illustrate the matter in the simplest way possible, and at the same time in a practical and scientific manner, without introducing mining details, or terms that might divert the reader from comprehending the more essential points requiring illustration, while stating what may be useful in making these explosions better understood. By adopting this course, he hopes the reader will arrive at a proper understanding, as well as discover a perfect preventative for these formidable explosions.

Two great obstacles are generally met with in coal mining; these are the inflow of water and the inflow of inflammable gas into the mine. The inflow of water has been overcome by well directed mechanical contrivance, while the inflow of gas remains only partly removed, as the difficulty of getting quit of the gas arises not so much from its quantity as from the fact that the responsible parties are ignorant of gas being in dangerous quantity in any particular part of the mine. For if this were known, one-twentieth of the attention and expense willingly laid out in getting quit of the water would dispense the mine gas. But the want of this knowledge prevents well-directed efforts being made at the proper times and places to ensure safety. This want of knowledge of the presence of mine gas may be said to be the principal cause why explosions are rendered possible in coal pits; and the mine gas explosions may therefore be expected to occur as frequently in the future as they have done in the past, and

are like to continue so until the presence and proportions of mine gases are easily and correctly obtained.

The writer, at least, is of this opinion; and to remedy this great evil he has invented a very simple instrument whereby the presence and proportions of these gases are ascertained to within less than one thousandth part when mixed with air. A common workman, with an hour's tuition, will be able to use this instrument, which will be introduced to interested parties in a few weeks, and, if wisely used, will enable all intelligent persons employed in these mines, to understand the general laws which govern the inflow of gas, to ascertain the quantity furnished by the mine every 24 hours, whether the inflow be constant or otherwise. This gas will be traced to where it enters the mine, to which place the miner's attention will be specially directed; and other important information will be supplied by this instrument, which is at present much required, but hitherto was not to be obtained.

The principle on which this instrument is constructed, is by fixing a tube or pipe 107 fathoms in height, up the shaft of the mine, terminating in a re-curved and open mouth, to the bottom of which pipe a glass tube is attached, placed similar to a spirit level, but inclined four-tenths of an inch for every twelve inches in length, the lower end of the glass tube being immersed in water, contained in a small vessel attached to the instrument. This mine gas is represented as being specific gravity .5554, and if any gases of that specific gravity did fill this tube of 107 fathoms in height, the water level in the glass tube would be elevated exactly 4 inches, in consequence of the lightness of the gas compared with atmospheric air. These 4 inches of water column are divided into 100 equal parts, placed on a scale alongside of the glass tube. This scale commences at a level of the water when there is no mine gas in the long tube. The glass tube being inclined at the angle above stated, requires to be 10 feet in height, so as to show the full rise of 4 inches; but to render this glass tube convenient, 30 inches will be all that is necessary to serve this purpose. Every division of one hundredth part will, therefore, be twelve-tenth inches in length, and each will indicate one hundredth part, or six feet six inches of gas, contained in the long tube. These divisions are further sub-divided into ten equal parts, and each minor division will be near $\frac{1}{2}$ of an inch in length, and each will represent 1,000th part or eight inches of gas in the long tube. When using this instrument the long tube is to be filled with gases from that part of the mine desired to be tested, the level of the liquid in the glass tube will indicate by the figures it has reached on the scale the exact quantity of mine gas contained in the long tube, and this without any calculation whatever. By this instrument the gas must be accurately weighed without the intervention of any mechanical contrivance, and rendered still more certain by weighing 107 fathoms of the gas at one time. Although 107 fathoms have been fixed upon as the height of tube to be used in mines, it will be found in many cases to be more convenient to reduce the height even to 20 fathoms, which may be done, and the instrument will still be found indicating sufficiently for practical purposes—the height of tube giving more decided indications in proportion to that height, but these are always accurate. The length of glass tube proposed is 30 inches, which will indicate 20 per cent. of gas and upwards, and when the gas forms the principal bulk of the gases, by filling the mine tube $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{4}$, and multiplying the indications accordingly, otherwise altering the inclination of the glass tube, and substituting a suitable scale, will furnish equally correct readings and make the instrument more convenient to manage. Having this

instrument in a coal mine cannot prevent a single explosion therein; but the frequent and continuous use of it when intelligently employed will enable miners to perceive the presence and extent of dangers not otherwise recognisable to the senses.

For the purpose of filling the long tube with the gases from the mine, a cubical box of tin-plate is used, which may be called a gas container, of such a size as is more than sufficient to fill the long tube, having a small tap at the top, to which a flexible tube is attached, so as to reach from a man's shoulder to the roof of the mine, and another small tap at the bottom for the purpose of easily filling and emptying the gas container. This vessel, when filled with water, is to be suspended by a strap to the shoulder of the fireman, and conveyed to that part of the mine desired to be tested; the open end of the flexible tube is then directed to the spot from whence the gases are wanted for testing, the two taps are then to be opened, the water will then run entirely out of the vessel, and may be received in a similar vessel to the left by the fireman at any suitable part of the mine, and by this means save the carrying of the water from the pit bottom, after which the two taps are to be shut, and instead of water the gases wanted for testing will be found contained in the vessel, ready to be pressed into the long pipe in the mine shaft, which may be done by attaching the flexible tube to the tube in the mine shaft, opening the two taps and immersing the gas container in a vessel of water. If carbonic acid gas be present, a small quantity of caustic soda or potash may be introduced into the gas container, and thus get rid of the heavy gas. In this manner the contents of 10 or 12 of these gas containers may be separately and correctly tested within an hour.

Mine gas, when mixed with air, burns slowly when in contact with flame in all proportions; but these gases are not explosive by a common flame if one measure of gas be mixed with seven of air, neither is a mixture of one of gas with thirteen explosive; but mixtures of gas and air between these limits explode with great violence. The explosive property depends principally on the nearness of the combining gaseous particles to each other before the explosion, and this may be observed by slightly compressing a mixture of one of gas to seven of air, when it will explode. On the other hand, if the bulk of gases mixed in the proportion of one of gas to ten of air (which is the most explosive proportion) be expanded, the mixture will be found incapable of exploding, so long as the mixture remains enlarged. It is different if these mixtures of gases are brought into contact with a gas explosion. In such a case, the explosion instantly extends into the dilute gaseous mixtures, and leaves the excess of air mixed with carbonic acid gas and watery vapour. And practical men would commit a grievous error, if they trusted for safety to the ventilating current when containing one of gas to 14 or 15 of air, or any other large per cent. of mine gas.

A coal mine is a great cavity, sometimes upwards of 150 fathoms underground, composed of air courses, chambers, and roadways, for the purposes of ventilation, of procuring and withdrawing the coal from the mine, all of which are cut out of the coal strata. The air courses are tortuous, and frequently over 40 miles in length; the walls, roof, and floor, being nearly all coal, expose a large surface to the air. In some localities, inflammable gas proceeds from the joints, and in others most likely from the coal also, which collects near the roof, and explodes with great violence on the approach of an unguarded light. This gas has no smell, does not affect the breathing injuriously, and its presence is generally ascertained by the effects it produces on the flame of the miner's lamp.

A coal mine, chemically considered, is a chamber composed of coal, and containing a large volume of atmospheric air, the coal, as far as the miner is concerned, being chiefly carbon in combination with hydrogen, while the gaseous contents of the mine consists of 20 oxygen and 80 azote in every hundred measures. If the oxygen so contained in the mine were brought into chemical contact with the coal surface, water, carbonic acid, and several fetid products would be formed, and attended by a violent explosion; the azote possesses no affinity for the elements of the coal; it, however, dilutes the oxygen, and by this performs an important part in mitigating the severity of all explosions in coal mines.

In a mine constructed with much coal surface exposed, should a chamber be formed, say 12 feet square and 6 feet in height, this chamber carefully whitewashed, and communicating with the air course several hundred fathoms from the upcast shaft; and if gas were to collect in this chamber until 6 inches rest on the roof, a violent explosion would follow on the approach of a light; the gaseous contents of the chamber would then be found occupying three times their original volume, and the exploding and expanding gases would be impelled along the air course, one portion to the upcast, the other to the downward shaft of the mine. This above is a simple mine gas explosion. Unfortunately this is not always the end of the explosion, as the incandescent gases are impelled with great rapidity along the extensive coal surfaces in contact with the oxygen in the air course. The explosion is thus continued, thereby producing great pressure, which frequently destroys the ventilating arrangements within the mine, and often the apparatus by which the miners are brought to the surface, in such cases with almost certain destruction to the underground workers. What is described as following the mine gas explosion may be called a coal pit explosion.

The coal pit explosions differ greatly from the preceding, although they are produced by explosions of mine gas; afterwards they are continued by gases disengaged from the coal surface, and are then completely independent of the original mine gas explosion, as the gases disengaged from the coal surface by the explosion are greatly in excess of what is required to continue the explosion to the pit bottom: a large volume is, therefore, collected in the mine. The coal pit explosions are always attended with dense, tarry smoke, hydro-sulphuric, acetic, carbonic, and sulphurous acids, ammonia, and other fetid vapours which are discharged from the coal surface. The products of the coal pit explosions are represented by the gases, &c., that are obtained from the distillation of coal before being purified, and would be identical in composition, provided a portion of atmospheric air had been introduced into the retort while the gases were being disengaged from the coal. This kind of explosion is in fact a temporary smothered fire in the passages in the coal pit, by the firing of the coal surface. The oxygen being completely consumed by the explosion passing through the contracted passages, extinguishes the fire as it proceeds to the pit bottom. A fire in a common house chimney, with the vent shut up, immediately after the flame has reached the chimney top, exhibits several of the characters of a coal pit explosion.

As the phenomenon of a coal pit explosion is somewhat complicated, the general reader will better understand the nature of it by considering a very long tube or pipe to represent the air course in a coal mine—the one end of the pipe to represent the upcast, the other end the downcast shaft of the mine. And, further, supposing two sky rockets were placed near the centre of such tube, and then fired, these rockets would, of course, fly from each other to the ends of

the pipe; and, in the same manner, two fiery currents proceed from the mine gas explosion. The one retires into the mine and downcast, the other to the upcast shaft. This double fiery current is what takes place in all coal pit explosions.

After thoroughly discussing the various points and bearings of the subject, the author adds:

In conclusion, miners find a mine gas explosion to be a great calamity, while a coal pit explosion, which frequently follows, is their complete ruin, as after a severe coal pit explosion few persons can be recovered alive from the mine. A gas explosion can only be avoided with the greatest watchfulness and care, and generally arises from some misadventure; while a coal pit explosion can certainly be prevented by having the coal previously covered, as it can only arise from an explosion of mine gas. If the coal surface in a coal mine be protected by limewash, as here recommended, the mine gas explosion will not be so extensive or severe, as a large part of the exploding elements are derived from the coal surface during the explosion itself; but what is of the first importance, this covering will effectually prevent the discharge of gas from the coal surface during a mine gas explosion, and thus render impossible these coal pit disasters, which lately have been so destructive of human life.

The aim of the writer will be gained if these remarks prove the means of enabling miners to realize the danger incurred in working in fiery mines where the coal surface is not protected, and at the same time inducing scientific men, and those managing coal mines, to give the foregoing statements their unbiassed consideration. Adopting the means suggested, or employing others more likely to secure the working miner against the repetition of these sad accidents which lately took place in the Blantyre, Abercarn, and Dyras coal pits, the preservation of life and property will thereby be secured, and all these sad disasters brought to a happy end.

The above quotations will, we consider, suffice to excite sufficient interest in the pamphlet before us to induce all who are practically interested in the important subject of which it treats to give it careful perusal, and we may add that we commend Mr. Young's invention to favourable consideration.

WHEELER'S PHOTOGRAPHY.

"Practical Photography; being the Science and Art of Photography developed for Amateurs and Beginners." By O. E. WHEELER. London: The Bazaar Office.

As a work for elementary instruction in photography, we cannot say much for this book, but as a practical exposition of the art it is worthy of commendation. The directions for producing photographs by the collodion process are given in much detail and with considerable care.

SERIALS.

"House and Home," a journal for all classes; sanitary house construction; overcrowding; improved dwellings; hygiene; building societies; dietetics; domestic economies. Office, 335, Strand, London.

This journal still continues its useful career. By-the-by, it seems to be somewhat of a teetotal organ. An attractive feature of this publication is the introduction of portraits of men of eminence. Amongst those given in recent issues are the Rev. Dr. Richardson, F.R.S., R. A. Cross, Esq., M.P., Home Secretary of State, and the late Dr. Parkes.

Messrs. Cassell continue the publication of their scientific and useful serials with "The Great Industries of Great Britain," "Science for All," "The Practical Dictionary of Engineering," not to mention the "History of England" and many other works

which we have not space to mention. It is scarcely necessary for us to say more than that these works are kept well up to the mark, which is a high one.

From the other side of the Atlantic we have the *Engineering and Mining Journal*, the *Kansas City Review*, and the *International Review*, journals the high character of which is well sustained.

The Life Boat, or journal of the National Life Boat Institute, in its last quarterly issue, has important articles on Signals of Distress in the Night, the new Eddystone Lighthouse, and a very graphic sketch by Mr. James Payn, illustrating life-boat work. This last issue is altogether of high interest.

IMPROVEMENT OF THE BAR OF DUBLIN HARBOUR BY ARTIFICIAL SCOUR.

By JOHN P. GRIFFITH, Assoc. Inst. C.E.

THE primary object of all early engineering efforts connected with the port of Dublin appears to have been to provide a safe approach for vessels to the city. With this in view the great south wall was constructed during the eighteenth century. The rivers Liffey and Dodder, discharging into the sea at the head of Dublin Bay, flow over extensive strands laid bare at low water, and the channel cut by the rivers is used by vessels entering the port. The great south wall was built to shelter this channel from southerly winds, and also from the encroachment of sand. When completed, it accomplished to a great extent the objects looked for by its designers. Portions of the channel up to the city were still, however, very shallow, with a shoal beyond the extremity of the new wall, known as Dublin bar. This bank stretches from the north side of the bay across the entrance to the harbour in the form of a hook. The deepest water for vessels is round the end of this hook, but across the bank, in a direct line to sea, there is only a depth of from five to six feet at low water of spring tides. At the beginning of the present century many eminent engineers and naval officers were consulted respecting further improvements. Captain Bligh recommended a wall along the north side of the channel; Sir Thomas Hyde Page proposed a similar wall, and the formation of an island on the bar; while a proposal to construct an embankment or wall extending from the north shore towards Poolbeg emanated from the Corporation for Preserving and Improving the Port of Dublin, better known as the Ballast Board. Mr. Rennie, at that time considered the highest authority on the improvement of harbours, prepared an elaborate scheme, but he predicted little likelihood of much improvement on the bar. He expected an increased depth of three feet of water as the result of an estimated expenditure exceeding £655,000. To provide a better approach he considered it essential to construct a ship canal from some point on the adjacent coast, where deep water might be obtained, and finally recommended this entrance to be made close to the present site of Kingstown Harbour. Mr. Rennie's estimate for this work was £489,734. From 1802 to 1819 the question of the improvement of the bar appeared to have been in abeyance. Probably Mr. Rennie's scheme, from the large expenditure it would have involved, and the smallness of the results anticipated, tended to deter the Government from advancing the necessary funds for any particular scheme. About 1819 the Ballast Board found themselves in a position to carry out their own project of a wall or embankment from the Clontarf shore. Its object was to protect the harbour on the north side from the encroachment of sand, to shelter it from northerly and easterly winds, and to direct the tidal and river waters in a fixed channel across

the bar. Before, however, beginning this work an accurate survey of the river and bar was made by Mr. Francis Giles. Under the joint direction of Mr. Giles and of Mr. Halpin, the engineer of the Ballast Board, the rubble embankment, now known as the great north wall, was constructed, extending about 9,000 feet from the Clontarf shore, its extreme end being about 1,000 feet north of Poolbeg Lighthouse. Over 5,500 feet of this wall rose above high-water, the remainder being below that level, and the extreme 2,000 feet only reaching on the average half-tide.

During the first half of the ebb, the tidal and river waters running out of the harbour flow partly over the submerged wall and partly through the harbour entrance, between its termination and Poolbeg Lighthouse. As soon, however, as the tide gets below the level of the wall, the water contained within the two great piers of the port passes through the contracted entrance at Poolbeg. The velocity of the stream is thus greatly increased, and a channel has been formed across the bar with sixteen feet at low water of spring tides, where, in the year 1819, there was only a depth of 6½ feet, and there was reason to believe that a still further increase might be looked for. As the improvement of the bar appeared to be due to the water discharged from the harbour during the second half of the ebb, any addition to the tidal capacity of the harbour below that level might be expected to produce a corresponding increase in the depth on the bar. Such an increase in the tidal capacity of the harbour was actually taking place by the lowering of the north strand, the result of dredging ballast and the wasting away of the bank.

The consideration of the difficulties overcome in the improvement of the approach to the port of Dublin naturally led to the inquiry, what were the dangers which beset the maintenance of the deep water channel across the bar. These might be briefly summarised as reclamation within and outside the harbour. Reclamation inside the harbour would be dangerous as an encroachment on the scouring capacity of the harbour. Reclamation outside would result in the reduction of the area upon which sand entering the bay was at present deposited, would tend to drive the low-water mark rapidly further out to sea, and endanger the channel across the bar.—*I. C. E. Paper.*

A NEW METHOD OF DISTINGUISHING BUTTER FROM SOME OTHER FATS.

By WILLIAM GUSTAVUS CROOK, Public Analyst for Norwich.

HAVING been lately specially engaged in examining several kinds of fats for the purpose of identification, I will, as briefly as I am able, describe a method at which will in a few minutes distinguish butter from the fat of beef, mutton, or pork, or mixtures of them. The sample to be examined, if in the form of butter, must be first melted, and rendered pretty from water and salt, by filtration if necessary; ten grains are then to be placed in a test tube, and liquefied by placing the tube in hot water at about 150° Fahr.; remove the tube when ready, and add thirty minims of carbolic acid (Calvert's No. 2 acid, in crystals, one pound; distilled water, two fluid ounces). Shake the mixture, and again place it in the water-bath until it is transparent. Set the tube aside for a time. If the sample thus treated be pure butter, a perfect solution will be the result; if beef, mutton, or pork fat, the mixture will resolve itself into two solutions of different densities, with a clear line of demarcation: the denser of the two solutions, if beef fat, will occupy about 49·7; lard, 49·6; mutton, 44·00 per cent of the entire volume; when sufficiently cooled,

more or less deposit will be observed in the uppermost solution. If olive oil be thus tested, the substratum will occupy about 50 per cent; with castor oil, there is no separation. With some solid fats (not likely to be used fraudulently) no separation whatever takes place; the addition of a minute portion of alkanet root will render the reading of the scale extremely distinct by artificial light. The above method (although not intended to surpass other processes) is capable of wide application, the saving of a large amount of time, and the reliability of its results will at once recommend it as a "first step" in butter analysis.—*Analyst.*

A NOVEL ROTARY PUMP.

ORTMAN's rotary pump is made by Messrs. Van Goethen and Reallier, of Brussels. It may be used either as a pump, a hydraulic motor, or an air compressor.

An undulated disk is fitted accurately to the pump casing, and in a transverse chamber, which intersects the cylinder, there is a slide, which is slotted to receive the edge of the undulated disk. At opposite sides of the slide there are openings in the casing for the ingress and egress of water. The slide acts as the abutment, and the undulated disk as the piston.

A pump of this kind, having a thirty-nine inch disk, will deliver nearly eighteen gallons per revolution and may be driven at the rate of 150 revolutions per minute.—*Cronique Industrielle.*

SIR HENRY BESSEMER.

MR. HENRY BESSEMER, of Denmark-hill, Camberwell, on whom her Majesty has been graciously pleased to confer the honour of knighthood, in recognition of his services in the manufacture of malleable iron and steel, and in numerous other inventions, is a son of the late Mr. Anthony Bessemer, of Old Broad-street, London, and subsequently of Charlton, Hertfordshire, where he was born on the 19th of January, 1813. He was, to a very great extent, self-taught, and at twenty years of age exhibited a design at the Royal Academy, then located at Somerset House. He first attracted the attention of Lord Althorp, then Chancellor of the Exchequer, by an ingenious contrivance which he made for preventing frauds which were carried on upon a large scale by the transference of stamps from old documents to new ones; but, though the saving to the public purse was estimated at nearly four hundred thousand pounds a year, he never received any remuneration for his ingenuity. In 1856 he read before the British Association, at Cheltenham, his first paper on the manufacture of malleable iron and steel, which has given him a world-wide name—literally so, for the Americans have christened after him a thriving new town on the Cincinnati Railway, and "Bessemer metal" has become current in most of the languages of civilised communities. Mr. Bessemer's great inventions have been recognised both at home and abroad, for the Emperor of Austria conferred on him the rank of a Knight Commander of the Order of Francis Joseph, and the late Emperor of the French offered to his acceptance the Grand Cross of the Legion of Honour, in consequence of a report from the jurors of the Universal Exhibition of 1867 that his invention was of exceptional merit. He has also been the recipient of the Albert Gold Medal, presented to him by the hand of the Prince of Wales. It is stated by Blanch, in his "History of Camberwell," that in the course of his various experiments, Mr. Bessemer has taken out more than one hundred patents, and has paid to the Crown as much as £10,000 in stamps alone.

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THE SESSION 1878—1879

Is Ended.

N.B.—The Balance Sheet, 1879, can now be inspected.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

The Institute being now out of Session, no meetings have been held.

The meeting of the Executive Council, fixed for Thursday, 31st July, was to be held at the time of publication, and, therefore, cannot be reported in our present issue.

Monthly Notices.

William West, the last of that remarkable race of engineers represented by Arthur Woolf, Richard Trevithick, and Andrew Vivian, died recently at Tredenham House, St. Blazey, at the age of seventy-eight. The youth of West was familiar with the triumph of Watt over Newcomen; before his eyes Woolf made his first experiments of working his engines with two cylinders, and Trevithick applied a tubular boiler for generating steam. With keenly perceptive powers and indomitable industry, West profited by his opportunities, and he became the engineer to some of the most extensive and the deepest mines in Cornwall, introducing many improvements in the pumping and winding engines. During the construction of the Cornwall Railway Mr. West rendered considerable assistance to Mr. Brunel. In 1839 he was elected a member of the Institute of Civil Engineers. Mr. West eventually became a very large adventurer in Cornish mines, and realised a considerable fortune thereby. This was judiciously expended, without ostentation, in good works, and he leaves behind him a name respected for the evidences of scientific thought which surround his machinery, and revered for the straightforward honesty which distinguished his character.

Sir William Fothergill Cooke, so intimately connected with the late Prof. Sir Charles Wheatstone, in the introduction of the electric telegraph, died recently. He was born at Ealing in 1805, and was educated at Durham and at the University of Edinburgh. In 1826 he joined the East Indian Army. Returning to England, he assisted his father, Dr. William Cooke, in his lectures at Durham, and he studied anatomy and physiology at Heidelberg and Paris. In 1836 he first directed his attention to the use of electricity for telegraphic purposes, and in 1837 he was introduced to Wheatstone: they secured a patent for their inventions jointly, and became partners. Cooke became a director of the first telegraph company formed in England, and, through his energies and practical abilities, most materially aided Wheatstone in establishing the importance of the electric telegraph, which has since spread itself over the world.

A prize of 600 francs for the best systematic bibliography of the foreign and native literature, published between 1830 and 1880, relating to the history of Belgium from the earliest times down to the death of Leopold I., to be accompanied with an introductory notice of the principal works on the same subject which have appeared before 1830, is offered by the Société Bibliographique Belge. The competing MSS. are to be sent to M. Francotte, Quai de l'Industrie, 15, Liège, before March 1st, 1880.

Literary Projects.—Having purchased the copyright of David Roberts's "Holy Land," Messrs. Cassell, Petter, and Galpin are about to publish the work in monthly parts. Messrs. Chapman and Hall will publish a new work by Mr. Stuart Glennie, entitled "Europe and Asia: Discussions of the Eastern Question in Travels through Independent, Turkish, and Austrian Illyria." "Europe and Asia" ranges with "Isis and Osiris" and "Pilgrim Memories," and forms the third and last of the introductory volumes to Mr. Stuart Glennie's proposed history of Indo-European civilisation since the sixth century B.C.

A new edition of Prof. Leoni Levi's "History of "British Commerce" will shortly be published, brought down to the end of 1878, and illustrated by diagrams showing the progress of finance, wealth, commerce, and navigation, as well as the working of our banking laws in ordinary times, and on the occasion of great drains and commercial crises.

Mons. E. Fremy has a noteworthy communication in the *Comptes Rendus*, "*Recherches Chimiques sur la Formation de la Houille.*" All the experimental evidences given tend to modify very materially the hypotheses usually adopted to explain the formation of coal. He shows that many of the substances contained in the cells of plants—such as the pigments, the resins, and the fats of leaves—if submitted to heat and pressure yield compounds which approximate to bitumen. The vegetable matters producing coal are found at first to undergo a peaty fermentation which destroys all organisation, and this, by a secondary action, determined by heat and pressure, is converted into coal in the depths of the peaty mass.

Dr. Justus Ulrich, the Professor of Mathematics at the University of Göttingen, is dead.

The Scientific Review.

AUGUST, 1879.

TITULAR DIGNITIES AND MEN OF SCIENCE.

VERY recently there passed away from amongst us a well-known Inventor and Vice-President of the Inventors' Institute, who had done as much for the substantial benefit of his country—one may even say for the benefit of the whole world—as any warrior, any statesman, any legislator, any judge, that ever existed, how much soever he may be the object of our admiration or esteem. Who, it will be asked, is this most worthy personage? Was he prince or peer? Surely in an age and country that allows men of political distinction, who, although considered deserving of honour by one are,—repudiated by the other political party,—to raise themselves to Earldoms and the Garter, such a public benefactor must have been distinguished by some high titular honour? But, strange as it may appear to anyone who calmly philosophises on the matter, the answer to the above question is, that the worthy to whom we have referred did, it is true, possess a titular distinction; but it was the lowest that could be conferred, though one which certainly, in past times, was a distinctive mark of distinguished merit, and though at the present time men of high intellect possess it; yet it is very commonly given away to such successful traders as by connection with some great civic pageant or Corporate Adulation of the Sovereign, are by custom considered to have a claim thereto.

This titular dignity was, of course, the Knightly, and the eminent man referred to was Sir W. Fothergill Cooke, the eminent electrician, who died on the 25th June last, having been born at Ealing in 1806, and after receiving his education at Durham, and at the University of Edinburgh, commenced life by joining the East Indian Army in 1826. On his return to Europe, after leaving the army, he studied anatomy and physiology at Paris and Heidelberg, and occupied himself in modelling anatomical dissections for the illustrations of his father's (William Cooke, M.D.) lectures at the University of Durham. It was during his stay at Heidelberg that his attention was first directed, in March, 1836, to the adaptation of electricity to a practical system of telegraphing, and in the following month he came to England to perfect his plans and instruments. In February, 1837, he was introduced to Professor (afterwards Sir Charles) Wheatstone, who had then made several important discoveries

with the object of transmitting intelligence by electricity. In May, 1837, Messrs. Cooke and Wheatstone took out a joint English patent on a footing of equality for their existing inventions, and the terms of their partnership were more exactly defined and confirmed in November, 1837, by a partnership deed. Cooke became a director of the newly-formed Telegraph Company, and the first telegraph line in England was constructed from Paddington to West Drayton on the Great Western Railway in 1838-39. In 1843 Cooke was elected a member of the Society of Arts, and, in 1867, he and Wheatstone were awarded the Albert Medal, in recognition of their joint labours in establishing the first electric telegraph. He received the honour of knighthood on the 11th November, 1869, and on 25th July, 1871, he obtained a Civil List pension of £100. Sir W. F. Cooke was the author of several works, and, in 1856 and 1867, he read papers before the Society of Arts. The first was, "On the Utilisation of Sewage of Towns, by the Deodorising Process established at Leicester;" and the second, "On New Machinery for Cutting, Tunnelling, Quarrying, and Facing Slate, Stone, and Marbles."

But though science has lost one knight it has gained another, in the person of Sir Henry Bessemer, a Vice-President of the Inventors' Institute, whose merits as a man of practical science and inventor are so well known that it is scarcely necessary to enumerate them—iron and steel being the most prominent, but by no means the only great industries that Bessemer has brought under the influence of his inventive genius, to the increase of the prosperity of the nation and the pecuniary benefit of our manufacturers and merchants. Who amongst us can be otherwise than pleased to know that the merit of HENRY BESSEMER has not been altogether ignored, and that he has received the title of Sir Henry Bessemer, Knight.

To us, however, influenced by the sentiments to which we have given utterance, the contemplation of the bestowal of this titular distinction on such a man is not so satisfactory as it might be. We never could understand why there should not be an Order of Merit, in the ranks of which men of science, men of letters, and men of acknowledged public worth should be enrolled; or, rather, as all our orders of Knighthood have been transmogrified, we should suggest that men like Sir Henry Bessemer, Sir William Thomson, and many of our literary and scientific celebrities ought to be included in the list of that well-known and now most honourable order—the Knights of the Bath. It is not for us to make invidious comparisons, but some of the K.C.B.'s. would be absolute figures of fun when placed in juxtaposition with those eminent men whose names we have mentioned. The order of ordinary knighthood sheds no lustre upon them, though their names serve to preserve its social status and prestige.

Proceedings of Societies.

ROYAL SOCIETY.

JUNE 12TH.—The President in the chair.—Annual Meeting, for election of Fellows. The following were elected: Prof. J. Anderson, Rev. M. J. Berkeley, Sir H. Bessemer, Prof. A. C. Brown, W. L. Buller, G. H. Darwin, Prof. J. D. Everett, Prof. F. S. B. François de Chaumont, Prof. G. D. Liveing, G. Matthey, G. J. Romanes, Dr. A. Schuster, Prof. H. G. Seeley, B. Williamson, and Dr. T. Wright.

* JUNE 19TH.—W. Spottiswoode, Esq., D.C.L., President, in the chair. Eleven of the newly-elected Fellows were admitted into the society. The following papers were read:—"On the Existence of Liebreich's Proton in the Brain," by Messrs. A. Gamgee and E. Blankenhorn; "Note on the Existence of a Milk-curdling Ferment in the Pancreas," by Dr. W. Roberts; "On some recent Improvements made in the Mountings of the Telescopes at Birr Castle," by Lord Rosse; "The Measurement of the Ratio of Lateral Construction to Longitudinal Extension of a Body under Strain," by Mr. A. Mallock; "On the Motion of Two Spheres in a Fluid," by Mr. W. M. Hicks; "Microscopical Researches in High Power Definition," by Dr. Royston-Pigott; "Note on their Spectroscopic Papers," by Profs. Liveing and Dewar; "The Determination of the Effects of Tidal Friction by a Graphical Method," by Mr. G. H. Darwin; "Researches in Chemical Equivalence: Part III. Nickelous and Cobaltous Sulphates," by Messrs. E. J. Mills and J. J. Smith; "An Account of Experiments on the Influence of Colloids upon Crystalline Form, and on Movements observed in Mixtures of Colloids with Crystalloids," by Dr. W. M. Ord; "On the Formation of Hydrocyanic Acid in the Electric Arc," by Prof. J. Dewar; "On the Production of Coloured Spectra by Light," by Capt. Abney; "Relation between the Atomic Weights and certain Physical Properties (Melting Point, Boiling Point, and Heat of Formation) of Elements and Compounds," by Mr. T. Carnelley; "Separate Enumerations of Primes of the Form $4n+1$, and of the Form $4n+3$," by Mr. J. W. L. Glaisher; "Observations on the Effects of Chloroform and Ether on the Radial Tracing," by Dr. H. Jones; "On a New Tide Predictor," by Mr. E. Roberts; "Double Refraction and Dispersion in Iceland Spar; an Experimental Investigation, with a Comparison with Huyghens's Construction for the Extraordinary Wave," by Mr. R. T. Glazebrook; "On the Vapour Densities of Potassium and Sodium," by Prof. Dewar; "The Physical Properties of Liquid Acetylene," by Mr. G. Ansdell; "On the Origin of the Mineral Structure and Chemical Characters of Ophites and Related Rocks," by Profs. King and Rowney; "Note upon the Behaviour of Oxalic Acid and the Oxalates of the Alkalies, and of Potassium Iodide," by Dr. Downes and Mr. T. B. Blunt; "Preliminary Experiments on the Effects of long-continued Stress on the Elasticity of Metals," by Mr. J. T. Bottomley; "Note on the Paper (read April 24th) 'A Summary of an Inquiry into the Function of Respiration at various Altitudes on the Island and Peak of Teneriffe,'" by Dr. W. Marcet; "Agricultural, Botanical, and Chemical Results of Experiments with different Manures on the Mixed Herbage of permanent meadow, conducted for more than twenty years in succession on the same Land," by Messrs. Lawes and Gilbert; "Researches on the Comparative Structure of the Cortex Cerebri," by Mr. W. B. Lewis; "Report to the Committee on Solar Physics on the Basic Lines common to Spots and Prominences," by Mr. J. N. Lockyer; "On a New Method of studying Metallic Vapours," by Mr. J. N. Lockyer; and "Supplementary Note on the Volumetric Estimation of Sugar by an Ammoniated

Cupric Test, giving Reduction without Precipitation," by Dr. Pavy. The society adjourned over the long vacation to Thursday, November 20th.

GEOLOGICAL SOCIETY.

JUNE 11TH.—Prof. J. Prestwich, V.P., in the chair.—Mr. N. W. Rudstone-Read was elected a Fellow; and Mr. E. Dupont, Dr. Franz von Kobell, and Dr. E. Sauvage, foreign correspondents of the society. The following communications were read: "On a Mammaliferous Deposit at Barrington, near Cambridge," by the Rev. O. Fisher; "Further Discoveries in the Cresswell Caves," by Prof. B. Dawkins and the Rev. J. M. Mello; "On the Pre-Cambrian Rocks of Shropshire," Part I., by Mr. C. Callaway; and "On the Occurrence of a Remarkable and apparently New Mineral in the Rocks of Inverness-shire," by Messrs. W. Jolly and J. Macdonald Cameron.

JUNE 25TH.—Prof. P. M. Duncan, V.P., in the chair.—Mr. E. Garlick was elected a Fellow. The following communications were read: "On the Evidence that certain Species of Ichthyosaurus were Viviparous," and "On *Rhamphocephalus Prestwichi*, Seeley, an Ornithosaurian from the Stonesfield Slate of Kineton," by Prof. H. G. Seeley; "A Contribution to South American Geology," by Mr. G. Attwood; "On the so-called Midford Sands," by Mr. Buckman; "On the Physical Geography of the North-East of England in Permian and Triassic Times," by Mr. E. Wilson; "On the Formation of Rock-Basins," by Mr. J. D. Kendall; "On the Diorites of the Warwickshire Coal-field," by Mr. S. Allport; "On *Lepidodiscus Lebouri*, a New Species of Agelacrinites, from the Carboniferous Series of Northumberland," by Mr. W. P. Sladen; "On the Ancient River-deposit of the Amazon," by Mr. C. B. Brown; "On the Glacial Deposits of Cromer," by Mr. C. Reid; "On a Disturbance of the Chalk at Trowse, near Norwich," by Mr. H. B. Woodward; "On the Submerged Forest of Barnstaple Bay," by Mr. T. M. Hall; "On a Section of Boulder Clay and Gravels at Ballygalley Head, and an Inquiry as to the Proper Classification of the Irish Drift," by Mr. T. M. Reade; "On the Aegitic Rocks of the Canary Islands," by Prof. S. Calderon; "On the Cambrian (Sedgw.) and Silurian Beds of the Dee Valley as compared with those of the Lake District," by Mr. J. E. Marr; "On some Superficial Deposits in the Neighbourhood of Evesham," by the Rev. A. H. W. Ingram; and "Description of Palaeozoic Corals from Northern Queensland, with Observations on the Genus *Stenopora*," by Prof. H. A. Nicholson and Mr. R. Etheridge, junr.

ASIATIC SOCIETY.

JUNE 16TH.—Sir T. E. Colebrooke, V.P., in the chair.—The following gentlemen were elected members: as resident, General MacLagan, Mr. J. Gibbs, Col. J. Finlay; and as non-resident, Major P. L. N. Cavagnari, Dr. C. R. Stulpmagel, the Rev. J. Vaughan, and Mr. T. D. Beighton. A paper was read by Mr. J. W. Redhouse, "On the most Comely Names of God, as the Divine Titles are designated in the Koran and in the Literature of Islam." The author pointed out the popular idea of the Arabs having given ninety-nine names to God is really erroneous, and rests on no certain foundation, the fact being that all such names or titles extracted from Arabic writers would amount to more than four hundred. The many and various names used by dervishes and others in their own private and public worship are no part of the regular ritual of Islam as handed down by the Prophet. In confirmation of this statement, Mr. Redhouse read to the meeting several passages from the Koran.

JULY 7TH.—Sir T. E. Colebrooke, V.P., in the chair.—The following gentlemen were elected as resident members: The Rev. J.

W. W. Drew, Mr. J. M. Forster, Mr. L. Rice; as non-resident, Mr. J. H. S. Lockhart, Mr. S. J. Buchan; and as foreign honorary member, Prof. H. Kern, of Leyden. Mr. Cust exhibited a map of Japan, and gave an account of the character and mutual affinities of the Japanese and the Korean languages, based upon an elaborate paper prepared for the society's *Journal* by Mr. W. G. Aston, of the Consular service, Japan. Mr. Cust added that there was little hope of the publication of the late Mr. W. F. Mayer's Korean Grammar, which was announced as nearly ready before his lamented decease, as his MS. had been found to be very incomplete. Mr. H. F. W. Holt was elected a secretary of the society.

STATISTICAL SOCIETY.

JUNE 17TH.—Sir R. W. Rawson in the chair.—The following were elected Fellows: The Baron de Ferrieres, Rev. E. F. M. MacCarthy, Messrs. H. Philips, W. M. Baker, W. Weir, E. C. L. Fitzwilliams, L. Borchardt, J. Yeats, W. Lloyd, G. A. Jameson, R. Hamilton, G. N. Hooper, W. B. Ranken, J. Quail, H. J. Evans, W. L. Lowndes, T. Hankey, C. Gairdner, A. Kirkwood, J. Price, R. Scott, J. G. Rhodes, and G. Edward Francis. Dr. W. A. Guy read a paper "On Tabular Analysis."

LINNEAN SOCIETY.

JUNE 5TH.—Prof. Allman, President, in the chair.—Mr. A. D. Michael was elected a Fellow. Prof. Parker read a memoir "On the Structure and Development of the Skull of the Urodela Amphibia." Several forms are here worked out, the spotted salamander serving as a type. Some of the so-called "skin bones" appear early; other investing bones appear later, and the investing cartilaginous roof of the nose comes after the ear capsule cartilages. Some Urodela show a stapes, which is absent in *Ceradotus* and *Lepidosiren*. The transformation of the Anoura is carried on in the plastic larva and young to a greater extent than in the Urodela. A paper "On the Lichens collected during the English Polar Expedition of 1875-76," by Prof. Fries, of Upsala, was communicated by Sir J. D. Hooker. In Dr. Hayes's Arctic journey lichens were probably not brought away from a more northerly position than 78° N. lat.; but Mr. J. Payer in the German Expedition with certainty obtained specimens at Cape Fligely, 82° 5' N. lat. With the exception of these last, but three species of lichens hitherto have been published as found beyond 81° N. lat. Thus considerable interest is attached to those got under Capt. Sir G. Nares by Capt. Feilden of the Alert, and Mr. Hart of the Discovery. As these vessels wintered in different quarters, the localities where the lichens were obtained correspondingly are more numerous, thus adding to their value as indicative of vegetative life in the frozen regions. Mr. Hart got his at thirteen stations, Discovery Harbour, 81° 41' N. lat., being the most northern. Capt. Feilden records twelve stations, Westward Ho Valley, 82° 41' N. lat., being the limit. But Lieut. Aldrich gathered *Gyrophora cylindrica* on the shore of the "palaeocrystic sea," the northernmost spot trodden by man, viz., Cape Columbia, 83° 6' 30" N. lat. Prof. Fries notes that the so-called "fruticolous" and "foliaceous" lichen species are fairly represented, doubtless accounted for by the severe climate, but nevertheless seemingly at variance with the presence of musk oxen; added to which the reindeer moss is absent. This anomalous circumstance of the presence of large ruminants and deficiency of their usual lichen food, Capt. Feilden explains by stating that the musk ox in Grinnel Land does not feed on lichens but on mosses and grasses. The same officer has also pointed out that the lichen growth, curiously enough, increased in size of species with increase of altitude. Prof. Fries concludes

that, without the least credit being given to an open polar sea (existing, no doubt, only in fancy), lichen vegetation may exist at the very pole, if only land be there, and it occasionally be free from snow and ice. The following papers were also read: "On a New Species of *Helvella*," by Mr. W. Phillips; and "A Review of the Ferns of North India," by Mr. C. B. Clarke.

JUNE 19TH.—Prof. Allman, President, in the chair. Mr. C. Holme was elected a Fellow. Attention was called to two new folio volumes 'On the British Freshwater Fishes,' by the Rev. W. Houghton. These illustrate in colours all the known and new species. A paper was read "On a Remarkable Branched Syllis from the Challenger Expedition," by Dr. W. C. McIntosh. This Polychæte worm (*S. ramosa*), got in a sponge at the Philippines, is thread-like in thickness, with branches intricately arranged among the sponge meshwork, and possibly with one lead to many branches. Buds and secondary buds are very numerous on the latter, and in a free female foot bristle-tufts were observed. Altogether this branched annelid manifestly differs from anything hitherto recorded. There followed "Remarks on *Carpesium cernuum* as indigenous to Australia," by Mr. F. M. Bailey. This botanist supports Mr. Bernay's view as to the plant not being introduced to the Antipodes, but endemic. Mr. A. Hammond placed the main facts before the society of a paper by him, "On the Thorax of the Blow-fly." He referred to the views held by Andouin, Westwood, Burmeister, Lowne, and others, and pointed out from his own dissections wherefore he dissented from the opinions of the majority of these workers. He concluded that, from the analogy presented by other insects, from the evidence derivable from the phenomena of developmental change, and from a study and consideration of the nervous and muscular systems, all combine to show that the thorax of the diptera, as illustrated in the blow, is almost exclusively mesothoracic. This conviction is quite at variance with that promulgated by Lowne in his researches on the blow-fly. The Rev. J. M. Crombie gave "An Enumeration of the Lichens in the Herbarium of the late Robert Brown in the British Museum." These were collected in 1802-5, during the notable voyage of Capt. Flinders to New Holland and Tasmania, to the appendix of which a few of the common species were indicated. Many specimens bear Brown's MS. names, and are now for the first time described. A paucity of "saxicole" species in this, as in recent collections of exotic lichens, is to be regretted. A paper was read "On recent Species of Heteropora," by Mr. G. Busk. Excepting a solitary example in the British Museum, from Japan, lately described by Mr. Waters, our knowledge of these Polyzoa has been derived from fossil forms. Mr. Busk now adds to information on the living types as derived from the Challenger Expedition material. The abstract of a "Contribution to the Flora of Northern China," by Messrs. J. G. Baker and S. Le M. Moore, dealt with 600 specimens in the Kew Herbarium, which were collected by Mr. J. Ross in the little frequented province of Selim King, 40°-42° N. lat. Though many species among these are already known, yet the discovery of such forms as *Exochorda serratifolia*—an addition to a genus that has for many years remained monotypic—*Saxifraga Rossii*, *Brachylites paridiformis*, and *Betula exaltata*, along with several altogether new species, renders the collection a valuable one. The Rev. J. M. Crombie briefly indicated the substance of a reply by him to Dr. Stirton's remarks on his paper on the Challenger lichens. Then followed a paper by Pastor H. D. I. Wallengren, of Sweden, "On the Species of Caddis-flies (Phryganea) described by Linnaeus in his Fauna Suecica," with notes on and communicated by Mr. R. M' Lachlan. Twenty-

five species undergo a critical revision. "On the Bell Bird" was a paper by Dr. J. Murie, taken as read.

MATHEMATICAL SOCIETY.

MAY 8TH.—C. W. Merrifield, Esq., President, in the chair.—Messrs. A. J. C. Allen and E. Anthony were elected members. The following communications were made: "On the Complex whose Lines join Conjugate Points of two Correlative Planes," by Dr. Hirst; "Note on a Geometrical Theorem connected with the Function of an Imaginary Variable," by Prof. Cayley; "Some Definite Integrals," by the late Prof. Clifford; "A Method of Constructing by Pure Analysis Functions X, Y, &c., which possess the Property that $\int X Y d\sigma = 0$, and such that any given Function can be Expanded in the Form $\alpha X + \beta Y + \gamma Z + \dots$," by Mr. Routh; "The Numerical Calculation of a Class of Determinants and a Continued Fraction," by Mr. Dickson; and "On the Inscription of a Regular Heptagon," by the Rev. Dr. Freeth.

JUNE 12TH.—C. W. Merrifield, Esq., President, in the chair. Mr. R. C. Rowe was proposed for election. The following communications were made: "Notes on a Reduction of a System of Forces, and on Plane Curves," by Mr. J. J. Walker; "Notes on Determinants of n Dimensions," by Mr. L. Tanner; "Curves for the Inscription of a Regular Nonagon and Undecagon in a Circle," by the Rev. Dr. Freeth; "On Clifford's Graphs and on the Twenty-one Coordinates of a Conic in Space," by Dr. Spottiswoode; and two "Geometrical Notes," by Prof. H. J. S. Smith.

ANTHROPOLOGICAL INSTITUTE.

APRIL 29TH.—Dr. E. B. Tylor, President, in the chair.—The following new members were announced: Messrs. W. S. Duncan and E. K. Binns. A paper was read by Col. H. Yule, C.B., entitled "Notes on Analogies between the Indo-Chinese Races and the Races of the Indian Archipelago." The author first stated that the paper was written abroad some nine or ten years ago, and had been unaltered since. A large number of analogous manners and practices were adduced common alike to the peoples of the two regions, which Col. Yule remarked would singly be of no value as arguments for some original close bond of kindred between the races of the Indo-Chinese countries and those of the Archipelago; but when thus accumulated they must surely be admitted to have great weight, and to be too numerous and striking, considering the comparative contiguity of the regions occupied by those races, and the physical resemblances which often occur among those of them the most remote from one another, to be due merely to the parallel developments of isolated bodies of men in like stages of growth. A paper was read from the Rev. J. Aibree, jun., "On Relationships and the Names used for them among the peoples of Madagascar, chiefly the Hovas, together with Observations upon Marriage Customs and Morals among the Malagasy." It was remarked that in the Malagasy language there are in many classes of words strange deficiencies as compared with English, while at the same time in other groups there is great fulness and minuteness of distinction. Notice was taken of the low standard of morals generally prevailing through the island, and of the evidence of this given by the dictionary, in the absence of such words as "chastity" and "purity" and allied terms. The paper concluded by a description of the class distinctions among the Hovas, there being three main divisions, the Andrians, or nobles; the Hovas, or commoners; and the Andevo, or slaves; the subdivisions of which were also pointed out, together with the restrictions upon marriage between the different ranks of native society.

MAY 13TH.—Prof. W. H. Flower, V.P., in the chair.—Mr. Hyde Clarke read a paper "On the Ethnology, Mythology, and Philology of Races of Early Culture, Babylonians, Etruscans, Egyptians, Japanese, &c." Pursuing his former investigations, he now produced the comparative philology of Akkad, Coptic, Etruscan, Lydian, Phrygian, Thracian, Carian, &c., copiously illustrated. He showed the relationships of these among each other, and with the Ugro-Altaic languages, Georgian, the Himalayan, Naga, Kolarian, and other Indian languages, Basque, the Pomo, Hidatsa, and other American languages. All these he further showed to be related to the numerous languages now spoken in the more advanced highlands of Central and Western Africa, as Mandenga, Bornu, Pulo, Timbuktu, Houssa, Ashantee, &c. By reference to these larger stocks he conciliated the divergences which appeared on the intercomparison of other languages. Thus he illustrated many disputed points in the Akkad Grammar of M. Lenormant, and the alleged relations with the Finnic. In treating the mureology of the subject, Mr. Clarke referred to the marked differences between the Koord, Persian, Armenian, and Eastern Aryans, and the Germanic and other Western Aryans. His conclusion was that the so-called Eastern Aryans are descendants of the pre-existing Turanians, having merely acquired an Aryan language, and are to be assimilated to the Georgian and other white Turanians, to the Assyrians, and the Semites. To them he assigned the Etruscans and Lydians. If the Aryans were to be regarded as descended from High Asia, then the white Turanians may have descended from High Africa, and they were the authors of the early culture. When their power fell, although in Europe and Western Asia they were replaced by the Aryan migrations, yet in other regions they were extirpated by the black and brown (or red) natives. Abyssinia, in conformity with its own legends, was to be regarded as one of the last centres of this ancient empire, and the Himyarite as one of the last invasions under Semitic leaders. To the earlier epoch he assigned the American migrations and the mound-builders when he considered the Pomo as the possible language. Tracing a like conformity in a primitive mythology as in philology, the author marked out a Turanian epoch of Greece and Rome, and explained the relation between Etruscan and Norse mythology by the existence of a Turanian epoch of culture among the Germanic nations. Mr. A. L. Lewis communicated a paper entitled "Notes on some Irish Antiquities." He observed that the country round Dublin, while considered by Irish antiquaries to be comparatively destitute of rude stone monuments, nevertheless contained as many as some of those districts in England where they were most plentiful. In the Island of Howth, to the north of Dublin Bay, are the remains of a dolmen, called Finn's Quoite, the capstone of which measured no less than 15 ft. long by 6 ft. in thickness. South of Dublin, in the ground of Mount Venus, seven or eight miles from the city, is a stone, 20 ft. long by 3 ft. thick, leaning against one 8 ft. high. At Killeney Station, on the road to Bray, are remains known as the Druid's Altar and Druid's Chair; but the finest dolmen in the district is probably that in the Druid's Glen, Carrickmines, where five upright stones of large size support a capstone, 17 ft. long by 14½ ft. inside, and nearly 5 ft. thick, forming a chamber 10 ft. square. In construction these remains resembled those known as the Trevethas Stone in Cornwall. Of tumuli in Ireland the largest sepulchre is probably that known in the New Grange tumulus, situated between Navan and Drogheda. Its peculiarities were noticed by the author, and contrasted with the remains at Gavv Luis in Brittany, and with the cuneiform chambers at Wayland Smith, at Wellon, near Bath. Remains that

had been observed in the burial ground of the abbey church of Slane, near Navan, were next described; and the paper concluded with some interesting observations on the well-known round towers of Ireland, and some novel suggestions as to their origin and purpose.

MAY 27TH.—Dr. E. B. Tylor, President, in the chair.—A paper by Mr. H. M. Westropp was read, entitled "Notes on Fetichism," in which the views of Prof. Max Müller on the subject of fetichism, as expressed in his late lectures on the development of religion, were combated. A paper was also contributed by Mr. J. Matthew "On the Kabi Dialects of Queensland."

JUNE 10TH.—Mr. Hyde Clarke, V.P., in the chair.—The election of Mr. W. Wavell was announced. A paper was read, by Miss A. W. Buckland, "On some Cornish and Irish Prehistoric Monuments." Mr. C. Pfoundes also read a paper entitled "Some Facts about Japan and its People," and exhibited drawings in illustration of the same.

ZOOLOGICAL SOCIETY.

JUNE 17TH.—Prof. W. H. Flower, President, in the chair. The secretary read a report on the additions to the menagerie during May, and called special attention to several novelties. Mr. Slater exhibited a skin of *Ara glauca*, from Mr. Boucard's collection, obtained at Corrientes, and stated that having compared it with the *Ara* now in the Gardens, purchased in June, 1860, and hitherto named *A. glauca*, he had come to the conclusion that the living bird belonged to the allied form *Ara leari*. Prof. Flower called attention to the skull of the female sea-lion, which had lately died at the Southport Aquarium, and pointed out that it belonged to *Otaria Gillespii*, and not, as had been supposed, to *Otaria stelleri*. Mr. C. G. Danford exhibited and made remarks on some remarkable antlers of deer obtained during his recent journey in Asia Minor. Prof. Newton exhibited skins of some rare species of birds obtained in Jamaica. Mr. F. D. Godman exhibited and made remarks on a drawing of the manatee by Mr. Wolf, taken from the specimen lately living in the Westminster Aquarium. Hans Graf von Berlepsch exhibited and made remarks on the skins of two varieties of the Long-tailed Titmouse (*Mecistura caudata*), which occurred near Cassel, in Germany, one of which appeared to be the same as the British form of this bird. Papers were read by Dr. J. Murie, on the Manatee, containing the results of his examination of the specimen which was lately living in the Westminster Aquarium; from Mr. A. H. Garrod, on the brain and on other points in the structure of the adult male Hippopotamus which died in the Gardens in March, 1878, and on the mechanism of respiration as well as of the retraction of the head and limbs in certain Chelonia; by Dr. G. Jeffreys, on the second part of his work on the Mollusca of the Lightning and Porcupine Expeditions, embracing the families from Anomiidae to Arcoide. The number of species noticed was 100, of which four were new to science, and fifteen were hitherto unfigured. Particulars were given of the geographical and geological distribution of all the species, and their synonymy was discussed. Some species of Leda and Maletia were Sicilian fossils of the Pliocene formation, and had not been previously known as recent or living. These species occurred at great depths, a fact which showed that the sea-bed in that part of the Mediterranean had been considerably raised since the Tertiary epoch; by Mr. E. R. Alston, on the *Acanthomys leucopus* of Gray, showing that it does not belong to the genus *Acanthomys*, but to *Mus* proper: as the name *leucopus* is pre-occupied in the latter genus, he proposed to call the species *Mus terra reginae*; by Mr. W. L. Distant, on the African species of lepidoptera of the

genus *Papilio*: a new species from Magila, East Africa, was described, and the name of *Papilio Hornimani* was proposed for it; from the Count T. Salvadori, on the new Pheasant from Western Sumatra, which he had recently described as *Acomus inornatus*; by Messrs. Godman and Salvin, on some hitherto unrecorded diurnal lepidoptera, obtained by the Rev. G. Brown in Duke of York Island and New Ireland, together with descriptions of some apparently new species; from Mr. F. J. Bell, on the species of the genus *Tripneustes*; and by Messrs. Slater and Salvin, on the birds of Bolivia, based principally upon an examination of the specimens obtained by Mr. Buckley during two expeditions into that country.

CHEMICAL SOCIETY.

JUNE 19TH.—Dr. Roscoe in the chair. The following papers were read:—"On Gardenin," by Dr. Stenhouse and Mr. C. E. Groves. This substance has been extracted from "Dekamali gum," the resin of the *Gardenia lucida*. "On Dry Copper-Zinc Couples and Analogous Agents," by Dr. J. H. Gladstone and Mr. A. Tribe. By treating nine parts of coarse zinc filings with one part of finely divided copper in a flask over a Bunsen flame until the filings begin to lose their shape, dark grey granular masses are obtained. These masses constitute the dry copper-zinc couple, which is found to equal in activity the well-known moist copper-zinc couple prepared by immersing zinc foil in copper sulphate solution; ten grammes of the dry couple convert five c.c. of ethyl iodide into zinc ethiodide in about six minutes. Couples of other metals were tried, but none was found to be in practice superior to that formed of copper and zinc. "On the Action of Sulphuric Acid on the Hydrocarbons of the Formula $C_{10}H_{16}$," by Drs. Armstrong and Tilden. The authors deny the statement made by Ribau that the product of the above action yields a distillate when steam is passed through it consisting of cymene, with a liquid isomeric of terpene; this so-called terebene is really inactive camphene, melting at 47°. The crude colophene remaining after the distillation in steam yields on distillation 10-30 per cent. of volatile substances, inactive camphene, terpine, a paraffin-like body, an optically inactive camphor, &c. "Researches on the Terpenes, Camphor, and Allied Compounds: Part I. On Hydrocarbons associated with the Terpenes, and on the Formation of Cymene from Terpenes and Allied Compounds: II. On the Action of Iodine on Terpenes; III. Camphor Derivatives," by Dr. Armstrong. "Contributions to the History of Starch and its Transformations," by Messrs. H. F. Brown and Heron. The authors have examined in a most elaborate manner the action of malt extract at various temperatures and under varied conditions on potato starch. "On the Determination of Nitric Acid by means of Indigo with especial reference to Water Analysis," by Mr. R. Warrington. The author gives the results of much experience with this process, which has the advantages of great simplicity, speed, and delicacy; the results are, however, conditioned by many circumstances which must be known before the method can be applied with delicacy. "Notes on the Purple of the Ancients," by Dr. E. Schunck. The author has worked up about four hundred specimens of *Purpura lapillus*, a shell-fish found at Hastings, &c., and extracted the cyst containing the yellowish secretion, which in sunlight becomes purple and forms a permanent dye stuff. The colouring matter apparently belongs to an unknown member of the indigo-blue group. "On the Heat of Formation of Aniline, Picoline, Toluidine, Lutidine, Pyridine, Dipicoline, Pyrrol, Glycerine, and Furfural," by Mr. W. Ramsay. "On Ethylenic Chlorosulphocyanide and its Oxidation into Ethylenic Chlorosulphonic Acid," by

Mr. J. W. James. On mixing and heating potassium sulphocyanide with alcohol and chlorobromide of ethylene, potassium bromide and chlorosulphocyanide of ethylene were obtained. The latter with nitric acid gave chloroethylene sulphonic acid, the silver salt of which heated with ammonia furnished taurin. "On the Boiling Points of certain Metals and Metallic Salts," by Dr. T. Carnelly and Mr. W. C. Williams.

GEOGRAPHICAL SOCIETY.

JUNE 23RD.—The Right Hon. the Earl of Northbrook, G.C.S.I., President, in the chair. The following gentlemen were elected Fellows:—Major-General S. W. Crawford, Colonel J. B. Finlay, Colonel C. McMahon, Lieut. R. C. Temple, Rev. T. Foulkes, Rev. P. W. Wyatt, Messrs. C. A. Barclay, T. B. Edmonds, M. P. Hart, W. Harwood, R. W. Lees, W. R. Smith, and A. B. Wylde. The papers read were:—"Reports received from Mr. Keith Johnston, commanding the East African Expedition—1, Excursion to the Usambara Hills; 2, Information obtained regarding Routes between Dar-es-Salaam and Lake Nyassa."

BRITISH ARCHÆOLOGICAL ASSOCIATION.

JUNE 18TH.—Mr. H. S. Cumming in the chair. It was announced that H.R.H. the Prince of Wales had again consented to be patron for the Annual Congress, which will be held at Great Yarmouth. A large number of antiquities were exhibited, among which the following call for special mention:—An alchemic vessel, by the Rev. S. M. Mayhew, in the form of a dove, of Spanish workmanship, which probably contained love potions. By Mr. W. Myers, a classified series of terracotta heads from many places in Asia Minor and Italy: the nose in almost every case had been broken by the finders, and was pointed out that this was done to prevent the finder being "haunted" by the spirit of the object represented. By Mr. L. Brock, a series of fragments of Samian ware from Bucklersbury. The first paper was "On the Coronation Medal of George I.," by Mr. G. G. Adams. The chairman read a paper upon St. Felix, first Bishop of Dunwich, who died A.D. 650. There are sixteen saints in the Roman Calendar of similar name. St. Felix is represented with the jonquil flower. The Rev. S. M. Mayhew reported further discoveries at Lincoln. A milestone has been found standing in the centre of four great ways, as it did 1600 years ago. The inscription, which has been deciphered by Mr. Wordsworth, contains the name of Victorinus. The stone stands 7 ft. 3 in. high, and has been removed to the cathedral cloisters. A drawing of a pavement was exhibited by Mr. Parker, and it was announced that Mr. Allis had preserved several of the singular pedestals found recently. Mr. W. Money described a Roman interment, recently discovered at Hampstead Norris; and the proceedings were brought to a close by a paper by Mr. W. De Gray Birch, who called attention to the inscription on the so-called Ovin's stone in Ely Cathedral.

ENTOMOLOGICAL SOCIETY.

JUNE 4TH.—H. W. Bates, V.P., in the chair.—The following elections took place: Mr. J. Walhouse as an ordinary member; Senhor A. Augusto de Carvalho Monteiro, Lisbon, as a foreign member, and Mr. C. H. Godman as a subscriber. Mr. M'Lachlan called attention to a notice lately published by M. F. A. Forel concerning certain sculptured markings on cretaceous pebbles from the shores of Lake Lemane, in which the author had come to the conclusion that the markings were mainly due to the action of larvae of Trichoptera, which formed galleries on the surface. Mr. M'Lachlan exhibited plaster casts of two small blocks, one of Jurassic limestone, the other of ordinary white chalk, which had been placed in the lake by M.

For some months, and which showed markings that apparently confirmed the theory that such were due to the agency of tricopterous larvæ, of which some specimens in alcohol were also exhibited. Mr. J. S. Baly communicated a paper entitled "An Attempt to point out the Differential Characters of some closely allied Species of Chrysomelæ, chiefly those contained in Suffrian's 11th Group; also Descriptions of some hitherto uncharacterised Forms belonging to the same and other Genera of the Family. The following papers were communicated: by Prof. Westwood, "A Decade of New Cetoniidæ" and "On some unusual Monstrous Insects." Mr. W. L. Distant read a paper entitled "Contributions to our Knowledge of the Hemipterous Fauna of Madagascar." Sir S. Saunders communicated some notes received from M. J. Lichtenstein, describing the metamorphoses of the blister-beetle (*Cantharis versicatoria*), which he had recently succeeded in rearing from the egg. Mr. Meldola communicated a translation of a paper by Dr. Fritz Müller, recently published in *Kosmos*, entitled "Ituna and Thyridia, a remarkable Case of Mimicry in Butterflies."

HISTORICAL SOCIETY.

JUNE 12TH.—Mr. J. Heywood in the chair. Fifteen ordinary members were elected. The following papers were read: "The Renaissance and its Influence on English Society," by Mr. E. Christie; "Advance of the Christian Civilisation in Europe, from the Fall of the Western Empire to the Revival in the Time of Charlemagne," by Prebendary Irons; and "Henry the Eighth's Book against Luther, 'Assertio Septem Sacramentorum,' which gained for our Sovereigns the title of Defender of the Faith," by Mr. J. M. Brown. Mr. Brown exhibited a copy of the original Latin treatise, discussed the question of its authorship, and gave an outline of the history of its title.

PHYSICAL SOCIETY.

JUNE 14TH.—Prof. W. G. Adams in the chair.—Messrs. D. Macalister and St. G. Lane Fox were elected members. Prof. Macleod described a plan for suppressing the induction disturbances at a telephone circuit. Dr. O. J. Lodge exhibited his new reversing key for detection work, which is preferable to the ordinary forms as giving a high insulation, small capacity, and not requiring the hand to approach close to it to work it. Mr. J. F. Moulton demonstrated the results of the experiments made by Mr. Spottiswoode and himself on the sensitiveness of electric discharges in vacuum tubes. Dr. H. Draper, of New York, addressed the meeting on his discovery of oxygen in the sun by bright lines in the solar spectrum.

JUNE 21ST.—An extra meeting was held at Cooper's Hill Indian Engineering College on the invitation of Col. Chesney, R.E. Lord Rosse in the chair. Prof. Unwin read a paper "On Experiments relating to the Friction of Fluids on Solid Surfaces against which they Rub." Prof. Unwin exhibited a piece of apparatus with which he hopes to study the stress of rivetted plates under shears by means of elastic substances such as caoutchouc. Lieut. G. S. Clark explained the process invented by Prof. Macleod and himself for determining the absolute pitch of tuning forks. Prof. Macleod described an electric clock used in the foregoing experiments. Mr. J. W. Clark described some experiments on the surface tension of sulphurous anhydride sealed in a capillary tube within a second tube containing the same substance.

JUNE 28TH.—Prof. W. G. Adams in the chair.—Mr. J. F. Moulton and Mr. J. J. Eastwick were elected members. Prof. W. G. Adams, President, exhibited his new measuring polariscope. Sir J. Conroy, Bart., read a paper "On the Distribution of Heat in the Spectrum." Mr. Grant described an

investigation which he has made into the induction lines round two parallel lines of wire. Dr. Shottle described his experiments proving the lines of force in a bar magnet to run spirally round the bar between the equator and poles, the equator being decanted and oblique across the bar, as shown by diagrams. Prof. Rowland made some observations on the new theory of terrestrial magnetism of Profs. Ayrton and Perry. Mr. C. Cooke exhibited a small voltaic element, showing the internal current.

THE STEAM ENGINE OF THE FUTURE.

IN the form of a pamphlet the well-known author of many valuable works on the steam engine has now given forth some admirable suggestions, and sensible provisions, as to the future of the wondrous machine. We shall at present content ourselves with allowing Mr. Bourne to speak for himself on this pregnant subject. He observes that "the benefit of working steam engines expansively is well known to engineers, as also the necessity of employing a steam jacket in engines so worked, to obtain the full benefit of the expansive principle. It is not generally known, but is nevertheless the fact, that in high speed engines there is a further benefit arising from the inability of the cylinder to become sensibly heated and cooled at each stroke, from the shortness of the time given for that process, and in such engines the cylinder approaches to the condition of a non-conductor, which is known to be favourable to the economical generation of power. Then, in the case of all high-pressure engines, it is easy to see that a considerable pressure must be more beneficial than a lower pressure. To raise a given quantity of water into steam takes just the same quantity of heat, whether the evaporation is effected at the pressure of the atmosphere or at six or eight times that pressure. But at the low pressure the steam will not generate any power, whereas at the high pressure it will generate much power. A very high pressure of steam, however, is inconvenient, as it involves a corresponding strong and heavy boiler, an extra strong and heavy engine, and separate expansion gear, which is not compensated by the small amount of increased economy obtained from excessive pressure. I have found a pressure of about eight atmospheres to be, on the whole, the most eligible that can be adopted.

"Supposing a good and cheap small engine to be available—an engine that will be strong, simple, safe, light, noiseless, and economical in fuel—not only would all its industrial applications be extended, but it would find a new and wide sphere of usefulness in ministering to domestic wants, one of the most widely pervading of which is the want of a simple motive power. In American hotels steam engines have long been employed for brushing boots and cleaning knives. They are the docile and inexpensive Helots of the age, and the domestic production of the electric light is a new and important sphere for their energies. But besides these functions, a domestic engine may be employed in roasting meat, driving washing machines and mangles, driving sewing machines, in brushing hair, in preparing aerated waters, and in the country for pumping, for sawing wood, and for performing many other laborious operations. A steam engine may be made to cool houses in summer and to warm them in winter, to maintain fountains in conservatories, to work punkas, to produce ice, and to create and maintain a vacuum in safes for the preservation of meat. For such purposes the engine must obviously be of the simplest, most compact, and most inexpensive character, and should be attached to the boiler, so that the whole may be lifted in a piece, like a hall stove. The boiler should be provided with a self-acting feed of

water, and the fuel should be gas, which has only to be lighted to enable the engine to be put into operation. Gas companies will find ample compensation for the loss of their lighting function in the creation of a new heating function, which will become larger and more remunerative than the lighting has ever been. Instead of extracting from the coal only the illuminating gases, the whole fuel should be turned into combustible gas by the aid of super-heated steam, and all the fires of houses could be maintained by this cheap gas burning in jets amid pumice, which it would keep red hot. There would then be neither dust from grates nor smoke from chimneys, and the gasworks would supply the fuel that is necessary for the generation of the electric light.

"I cannot pretend in this brief notice to enumerate all the improvements which the steam engine of the future should comprehend; but one essential quality is, that the boiler shall not be liable to internal incrustation, and that there shall be abundant facilities for easily cleaning it out. Most waters contain a certain proportion of lime, which is precipitated by boiling, and in tea-kettles this lime forms an internal crust, which is termed 'rock.' Such incrustation hinders the transmission of heat through the metal of a boiler, and is injurious in various ways. But there are known means of preventing its formation, and in the 'steam engine of the future' it is an indispensable feature that these means shall be embodied.

"The application of the steam engine to the propulsion of carriages, omnibuses, and cabs is now only hindered by its too heavy weight and too high cost. Asphalt pavements, which are objectionable for horses, afford for steam carriages a surface as eligible for easy traction as a railway, and without any countervailing fault. All wheeled vehicles, whether required to travel at a high or low speed, will be propelled by steam instead of horses as soon as the steam engine is made sufficiently light and sufficiently cheap to warrant the substitution. Life boats, instead of being open boats propelled by a number of men, should be decked boats propelled by a steam engine, and managed by only two men, one to steer the boat and the other to attend to the engine. Such boats should be propelled by a water jet which will always act, whatever may be the roughness of the sea, and whether the stern of the boat is in or out of the water. The use of the steam engine for irrigation in connection with the centrifugal pump is an application of which the sphere is limited only by the cost and the deficient portability of the apparatus. To render the class of small engines so much more portable, so much more simple, and so much less costly as to remove the existing impediments to their use, may certainly be accounted one of the most important problems of the present time, and I trust it is not presumptuous to hope that the cursory hints here given may accelerate the desired solution."—*Foreman Engineer and Draughtsman.*

IMPROVED ANCHOR.—An improved anchor recently patented by Messrs. Spedden & Stafford, of Astoria, Oregon, consists in a single fluke pivoted in a frame, and provided with cam-shaped tripping arms at its base. The frame or shank serves both as a shank and stock, and it has no projecting arms to entangle the cable or chains so as to foul it, and its action is rendered positive by the action of the trip arms.

An improved machine for the distribution of liquid or powdered poison upon cotton or other plants has been patented by Mr. Thos. B. Taylor, of Mount Meigs, Ala. It consists mainly in a perforated cylinder mounted on bearings supported by a plough beam, and capable of turning so as to sift or sprinkle the poison on the plants.

Correspondence.

INSTRUMENT FOR TESTING THE PURITY OF MILK.

TO THE EDITOR OF THE SCIENTIFIC AND LITERARY REVIEW.

SIR,—A new instrument for testing the purity of milk has been invented by Mr. A. Smith, and consists of a glass bulb, with a graduated stem, divided in the centre by a coloured line. All the percentages above the coloured mark represent the addition of water, while those below represent the addition of salt. This little instrument is wonderfully sensitive to test the purity of milk. A small quantity is taken, and the casein precipitated by the addition of a little vinegar or hydrochloric acid, and filtered. The serumeter is now placed in the clear liquid, and if water has been added the quantity will be at once registered. These instruments are being made by E. Atkins, chemist, 200, Essex-road, Islington.

E. A.

North London Chemical Laboratory,
Essex-road, June 6th, 1879.

TUCKER'S PATENT "UNIVERSAL" CRAMP.

A new kind of cramp has been patented by Mr. H. C. Tucker, of Exton Villa, Peterborough. It will be termed the "Universal Cramp." It is an ingenious contrivance of applying one cramp to several uses, viz., as a floor cramp, right or left hand, by simply turning it over. In cases of need it can be used as a drilling frame for several purposes on a building, also as a vice for small jobs. It is convertible into a joiners' or bench cramp, there being a very simple contrivance for shifting the short bar, and fixing a longer one in its place any length; as a floor cramp it will grip any thickness of joist or beam, from 1½ inches to 2 or 3 feet.

The great novelty is the simple but most effectual improvement in the sliding jaw, which can be set to any place on the bar, and it is instantly self-acting without wedge, roller, spring, pin, or chain, and the bar has no holes in it. This novelty seems to have escaped the notice of all cramp makers. The jaw can be applied to all ordinary cramps that now have pins, chains, and holes in the bar.

The usefulness of this cramp will be found by every purchaser to be equal to that of the best now made; and it cannot get out of order. They can be procured of all iron mongers and tool dealers.

FOREIGN SCIENCE.

A new scientific society has been formed in Paris called the "Academy of Meteorology and Aerostation." The founders of the society have been inspired by the idea originated, we believe, by M. Le Verrier, of the advantages to be obtained in meteorological studies and researches by having aerostatic observations at a much greater altitude than those at which such observations are usually made. A museum of meteorology has also been established in connection with the society.

An account has lately been given by M. Teissonniere of the treatment of a vineyard covered by the insects known as phylloxera. The vineyard upon which the experiments were made consisted of a piece of ground about three hundred acres in extent, and contained about four thousand plants. A series of galvanised tubes on the Monillefort system was applied, through which a mixture, consisting of about three hundred kilogrammes of carbonate of potassium, diluted with a suitable quantity of water, was injected, and it appears that it had the desired effect of destroying nearly the whole of the insects without in any way injuring the plants.

The Academy of Sciences has elected M. Gylden to the post of astronomical correspondent, which had become vacant by the death of M. Secchi.

We learn from a Paris contemporary that some researches have been lately carried out with the view of ascertaining more clearly what has been hitherto done the causes of the destruction and damage to submarine cables caused by different species of marine animal-cule. It states that the destructive power of the *teredo* or *limmaria terebrans* is almost incredible. There are numbers of other kinds of rapacious insects, living, it is supposed, near the bottom of the sea, which are known to exercise a destroying influence on the gutta-percha in which the cables are enveloped; but the ravages of this one, it appears, far outvie those of all the others. In fact, the gutta-percha on some portions of the lines has been so entirely destroyed by them as to completely interrupt the conductivity of the wires for the time being. It is, therefore, necessary that some means should be taken forthwith to prevent this; and it is, among other things, suggested that the preservation of the cables should be effected by altering or modifying in some way the character of the composition or material in which they are now enclosed, as the destruction of the insects themselves would appear to be almost impossible.

The fourth volume of M. Charles Naudin and Radlkofer's "Researches on the Subject of the Influence which Changes of Climate exercise on Plants and Vegetables" has just been issued.

BRITISH SECTION OF PERMANENT COMMITTEE OF THE PARIS CONGRESS ON INDUSTRIAL PROPERTY.

THIS body is now taking action on the subject of the Patent Laws. It consists of Admiral Selwyn, Mr. Lloyd Wise, and Mr. Alexander, the barrister appointed by the Paris Congress; also Sir Henry Bessemer, Sir William Thomson, Mr. Gorst, Q.C., and Mr. Lewis Olrick, who have since been added to the Section.

The Section holds sittings every Tuesday at the rooms of the Society of Arts, John-street, Adelphi, at 3.30 p.m.

INVOCATION.

SUN of my Soul! whose influence benign
Breathes o'er my fevered spirit, giving light;
When in delicious dreams I leave this life,
And in sweet trance unveil its mysteries!
Give me thy light, thy love, thy truth
divine!

Guide me, in thy beneficence, to know
The good from evil of this two-fold life!
That when my spirit-wings shall be unfurled

In thy bright angel presence, I may take
The gold of glory, leaving else behind!

Sun of my Soul! O 'tis but yester night
Thou passed before me, swifter than the flash

That fires the heavens when the dread thunders roll!

And left me looking upward thro' the veil,
To gaze into thy goal, and follow thee!
From whence, to whence?—till darkness covered all.

Sun of my Soul! thy harmony brings peace;
Peace to my fevered spirit, while the world
Clings as a coil! more mortal e'en than death:

But not for ever! no, when purified
Thro' reincarnate laws, then shall I rise,
Swift as an eagle thro' this vale of tears,
Passing from mortal to immortal light!
Sun of my Soul! then shall I gaze on thee.

HENRY GEORGE HELLON.

SPONTANEOUS COMBUSTION.

THE St. Louis *Republican* gives this account of the origin of a recent mysterious fire in that city:—A well authenticated case of spontaneous combustion occurred recently in the suburbs of Oak Hill, the residence of Mr. Edward Mead, the jeweller, furnishing the sensation. The circumstances of the fire were, fortunately, such as to leave no doubt regarding its cause, and these circumstances are especially interesting in a city where fires of a mysterious origin have been remarkably frequent. The fire proved to be the result of spontaneous combustion, and from a cause which has been the one usually credited with effects of the kind. Some of the floors in Mr. Mead's house had lately received a thorough coating of coloured varnish, and, in the polishing, hemp cloths (squares cut from sacks) had been used. One of these sacks, saturated with the varnish, had been put in the basket for further use. It had of itself smouldered, and finally produced the fire. The case is a curious one, and of value from the knowledge it affords of a dangerous combination.

RECENT AMERICAN AND FOREIGN PATENTS.

An improved washing machine, which does its work principally by pressure upon the clothes, has been patented by Mr. Chas. P. Rood, of La Fargeville, N.Y. The machine consists of a tub having a number of deep transverse ribs in the bottom, and a fluted roller carried back and forth over the bottom by a carriage worked by a rack and pinion.

An improved clothes pounder, which acts by forcing air through the clothes, has been patented by Mr. C. F. K. Wilson, of Seymour, Iowa. It is designed to clean the clothes without rubbing.

An improved hand truck, in which the bearer bars, to which the axle is bolted, and the back guard are made in one piece and bolted to the inner flanges of angle iron side bars, has been patented by Mr. Thos. Hill, of Jersey city, N.J.

Mr. Frederick Hollick, of New York city, has patented an improved vehicle wheel, having a flanged tire and felloes provided with radial spokes, which are secured in the divided hub in a novel and substantial manner.

An improved guide for harness makers' sewing machines, which enables the machine to be used in sewing up seams in round lines, has been patented by Mr. James W. Hollingsworth, of Paoli, Ind.

An improved press, for baling cotton and other similar materials, has been patented by Mr. E. F. McGowen, of Houston, Texas. This invention consists in a novel arrangement of gearing for operating the press without changing the motion of the driving shaft.

Messrs. D. W. and H. Johns and Henry Embs, of New Albany, Ind., have patented an improved machine for making ox-polls. In this machine the ox-polls are made by rolling process, the iron bar being first bent into a V-shape, and the eye formed; the ends or flanges are then closed by stationary dies as the poll comes from the roll.

Messrs. C. H. Lane, W. A. Hutchins, and John McGrew, of Garnettsville, Ky., has devised an improved washing machine, which consists of two hollow cylinders provided with longitudinal ribs and arranged to rotate in contact with each other.

An improved machine for operating a clothes pounder or churn dasher has been patented by Mr. P. C. McCune, of Mount Etna. A revolving platform supports the tub or churn, and a reciprocating lever carries the pounder or churn dasher, as may be required.

An improved carriage wrench, which consists essentially of a socket wrench divided longitudinally, the two parts being jointed

together and provided with adjusting screws, has been patented by Mr. E. A. Robins, of Fairfield, Me.

Mr. Abner Hart, of Ogden, Ill., has devised an improved washing machine, which is provided with recessed pounders having air pumps attached, and with foot levers in connection with hand levers for operating the pounders.

An improved machine for operating a churn, turning a grindstone, sawing wood, and for other applications where a small power is required, has been patented by Mr. E. H. Drake, of Horseheads, N.Y. The invention consists in a novel arrangement of a weight and gearing.

Mr. John Overmeyer, of New Lexington, O., has devised an improvement in time locks, which is so arranged that in case the watch movements which control the main bolt should stop the lock may still be opened from the outside at a certain fixed time.

An improved heat regulator, patented by Mr. E. S. Gary, of Baltimore, Md., is operated by the expansion and contraction of a fluid acting on a piston connected with the damper of a stove or furnace.

Mr. Henry Reese, of Baltimore, Md., has patented an improved wrought iron railway tie, having upturned lugs for holding the rail and provided with an ingenious locking device for preventing the displacement of the rail.

A new pad for securing an extra pad or housing to a harness saddle, which holds the pad securely, preventing it from sliding, drawing and twisting, has been patented by Mr. Turner Buswell, of Solon, Me.

An improved cartridge, having a shell capable of taking a number of balls each, supplied with a separate charge of powder, and arranged so that the foremost charge will explode first and the others in succession, has been patented by Mr. John E. Tyler, of Roxobel, N.C.

Mr. Ira L. Sherman, of Cattaraugus, N.Y., has patented an improved iron fence, having an ornamental two-part rail which clamps the pickets on opposite sides, and is held together by sleeves which slip over the two parts.

Mr. George Lizars, of Paris, France, has devised an improved wet gas meter, provided with a compensating measuring drum, by which a uniform amount of gas is passed through the meter without regard to the level of the water.

An improved gag runner for harness has been patented by Mr. William M. Blain, of Salinas, Cal. It is adapted to receive a rosette for attachment to the bridle, and it forms a neat and simple attachment to the bridle for guiding the reins.

A novel and simple device for holding and displaying sample shoes on shoe boxes, has been patented by Mr. Benton Elliott, of Ellsworth, Wis. It consists of a spring clasp made from sheet metal, and it may be applied to the shoe and the box.

An improved garden roller, in which the handle counterpoising weights are formed in circular plates, which also serve as ornamental heads for the roller and as dirt protectors, has been patented by Mr. Joseph W. Hobson, of New York city.

Mr. Napoleon W. Williams, of Philadelphia, Pa., has patented an improved process for bronzing metals, which consists in first coating the object with paraffine varnish to close up the holes, make a smooth surface, and stop oxidation, then covering the varnished surface with plumbago, to render it conductive, and finally depositing upon said surface of plumbago a coating of the required metal by galvanic action.

An improved hair trigger for firearm, which is complete in itself and may be applied to any kind of firearm without change in its construction, has been patented by Mr. Emil A. F. Toepperwein, of Boerne, Texas.

Mr. Joseph B. Underwood, of Fayetteville, N. C., has devised an attachment for a sewing machine treadle, which is connected with the chair in which the operator is seated, and the weight of the body, being slightly rocked or shifted from one point to another, assists in driving the machine.

An improved safe or vault, provided with air and water-tight chambers entirely surrounding it, has been patented by Mr. Samuel A. Wilkins, of Victoria, Texas. The chambers are arranged so that they may be filled with water from the exterior of a building. The inventor also provides an ingenious burglar alarm.

Mr. John B. Belcher, of Charlotte, Mich., has patented an improved stray for rubber boots, which consists of a rigid ring connected with the boot-leg by a strap. The inventor claims that the strap is stronger and more convenient than the ordinary ones.

A novel mechanical movement for converting motion either for an increase of power or speed has been patented by Mr. Theodore Scholze, of Angola, Ind.

An improved hand stamp for cancelling postage stamps, and printing, dating, and marking generally has been patented by Mr. William J. Blackwell, of Waynesborough, Va. The press has a cam shaft which moves the stamping devices, and a sliding plate, in such a way that when the plate is moved back to uncover the ink pads the cancelling stamps are forced down upon the pads.

An improved brake for waggons has been patented by Mr. William de Ray, of Murray, Ky. It is constructed so that it will be applied by the team in holding back, and will be taken off as the team draws forward. It is provided with means for locking it in either position.

Mr. John H. Jenner, of Leavenworth, Ind., has patented an improved brake lever for waggons. It consists of two levers, the principal one fulcrumed to the wagon body or frame, and the other pivoted to it and connected with the brake rod. The slack motion is taken up by the second lever, and the brake is applied by the principal lever.

An improvement in magazine firearms has been patented by Mr. Peder Bergersan, of Cheyenne, Wyoming Ter. The breech mechanism is opened and closed by means of a lever hung on a pin that passes through ears projecting from the underside of the trigger plate. The firing bolt or hammer is straight and is operated by a spiral spring. The gun may be used as a magazine gun or as a single breech-loading rifle.

An improved machine for flinching, grooving, and bevelling barrel staves when set up in barrel form, has been patented by Mr. Thomas M'Keever, of Pittsburg, Pa. It consists in a hollow cutter head carrying the grooving and crozing knives, and in peculiar mechanism for holding the barrel while being grooved and crossed.

Mr. C. Sullivan, of Three Rivers, Mass., has patented an improved spooling guide, which consists of a flanged and slotted head in which is a slotted plate held in a horizontal position by set screws. From this plate rises the guide, which is composed of two crescent shaped arms turned in opposite directions; with this device the yarn can be fed very evenly.

Mr. Wilson N. Fort, of Lewisville, Ark., has patented an improved rotary engine, which consists in a peculiar arrangement of a double rock valve, and hollow inlet and outlet valves, the whole being arranged with a view to simplicity and durability.

Messrs. John E. Duncan and Alanson B. Alden, of Boscobel, Wis., have patented a permutation lock, in which the combination is set by the act of locking, and in unlocking the parts are readjusted, so that the combination is not set while the lock is unlocked.

Messrs. N. B. Gunn and A. D. Menden-

hall, of Ellwood, Ind., have patented an improved apple corer and cutter, in which the tube and its radial knives are detachably secured to the slotted sliding board, so that the machine may be readily taken apart for cleaning.

An improvement in gun locks, patented by Mr. Thomas Duncan, of West New Annapolis, Nova Scotia, consists in a stop pivoted under the end of the mainspring close to the swivel and controlled by the trigger and a spring.

Mr. F. H. Purenton, of Brunswick, Me., has invented an improved sectional steam boiler, having a lower section or water chamber surrounding the fire chamber, and connected with an upper section by means of inclined pipes, the said upper section being provided with curved flues that communicate with the smoke stack.

Mr. W. H. Maple, of Chariton, Iowa, has recently patented an improved car coupler, which employs a combined link and pin. It is certainly very simple, and it appears to be a safe and practical device. It is operated from the side of the car, thereby avoiding the accidents common to the old link and pin coupling.

An improvement in drill jars, consisting in forming the links with rounded outer and inner surfaces and cylindrical anvils or striking heads, arranged inside at the ends of the links to receive the impact when the drilling tool is lifted, has been patented by Mr. J. E. Hughes, of Barnhart's Mills, Pa.

An improvement in hand and horse-power fire engines has been patented by Mr. A. S. Walbridge, of Mystic, Quebec, Canada. Three or more pumps are arranged radially around a vertical shaft, and operated by a single crank. The shaft is fitted with a hub for carrying sweeps, so that it may be driven by hand or horse power.

An improved centrifugal ore pulveriser and separator has been patented by Alexander Goodhart, of Carlsle, Pa. The invention relates to the construction of a cylinder, into which the ore matter is first received, and in which it receives a preliminary pulverising. This cylinder is surrounded by another cylinder that revolves in the opposite direction, and completes the pulverising process.

Mr. Sylvanus B. Nickum, of Jalapa, Ind., has patented an improved railroad switch, which may be operated from the locomotive or from the rear car of the train. The switch rails are operated by a lever, which is pivoted to one of the ties, and is engaged by a pin on the locomotive or car, the pin being arranged so that it may be dropped down into position to engage the lever or raised up out of the way.

A gang plough in which the tongue and axle-frame are combined with a pair of plough beams, connected adjustably at the rear end and pivoted to the tongue in front, so that it may be readily operated, has been patented by Mr. L. M. Kelly, of Litchfield, Kentucky.

SANITAS.—We have only got space to notice the fact that a very pleasant reunion was held by the Sanitas Company during the past month, when the progress of this invention, in which Mr. Kingzett, the eminent chemist, and Mr. M. Zingler are interested, was satisfactorily exemplified.

DAIRY FARMING.—It would hardly be possible to have chosen a more opportune time than the present, when public attention has been thoroughly aroused as to the general state of agriculture, for the publication of a comprehensive work on dairy farming. Such a work, written by Prof. Sheldon, and dealing exclusively with the subject, commenced its issue by Messrs. Cassell, Petter & Galpin contemporaneously with the opening of the great International Show at Kilburn.

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